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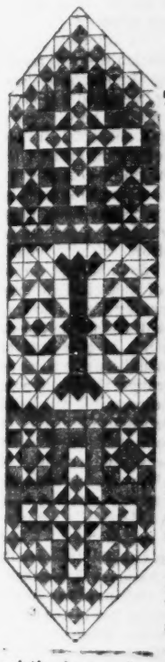


The "Jubilee" of the British Association.

It is difficult to estimate rightly the characteristics of our own time, or of a time close to our own, and there is among most men a tendency to unduly depreciate the present, to look back to greater things which were done in former times, and to regard the achievements of their own day as comparatively slight and wanting in the elements of grandeur which characterised the men and the achievements of some great epoch of the past. Those who are interested in artistic and architectural subjects especially are very familiar with this idea. Great and original architecture seems a thing of the past; painting is a much more feeble power in modern life than it was in the Cinquecento period; sculpture is far below what it was with the Greeks; no second Shakspeare has renewed the glory of the Elizabethan drama. The view taken by the *laudator temporis acti* cannot but be admitted to be, in the main, reasonable and true, if sometimes pushed too far, in regard to this class of the subjects of human study and interest. But those who therefore think that we have fallen on a weak and uninteresting period of human history forget that an age weak in one direction may be strong in another direction, and that it is often exactly when one class of faculties is comparatively weak and imitative, that another is strong and active in origination.

The reflection could not receive more marked illustration than by the comparison which the fiftieth anniversary of the British Association naturally suggests between the position of science now and when they held their first meeting in the same city. The result is really almost startling. It needs but to give this glance backwards in thought, to the state of the scientific world fifty years ago, to realise that we are living in one of the most remarkable epochs in the history of mankind. The mere material progress represented by the railway and electric telegraph system would be a great deal; they are certainly the most marked and important steps in what may be called the social mechanism of life that we know of in history, and their moral effects have indirectly been very great also. But these inventions and their results sink almost into insignificance when we look at the step which has been made in regard to our general theory of the history of our planet and the history of life on it, of our relation to our physical antecedents and our physical surroundings, of the very idea of what life means, which the deductions of science have led to during these fifty years. The step is really a tremendous one, and even to say that the epoch is as remarkable as that in which Galileo and Newton discovered some of the main truths about the solar system is far short of the truth. The discovery of the powers of spectrum analysis, and the consequent capability to grasp at the physical constituents even of the fixed stars, may be sufficient to set against that of the laws of gravitation by Newton; but some of the leading subjects of investigation of modern science are of a much more delicate and complicated nature than any investigations which are concerned with bodies moving by mathematical laws. The study of the infinite varieties of life on this planet, of the infinite varieties of disease too, and the manner in which they are produced and may be checked or nullified, is a study more complicated and requiring closer and more multifarious experiment and investigation than the apparently grander and more sublime, as well as more ancient, science of astronomy. But the influence of the study of life, past and present, on this earth, on what may in one sense be called our moral conception of life and its problems and duties, has been a tremendous one, where its significance has been grasped at all; and there has been no other epoch in which the influence of science upon man, not merely in regard to facts, but to the inferences from those facts, has been so immense and so important as it has been during great part of the last fifty years, and more especially during the last fifteen or twenty. To those who think at all about the meaning of what they hear, the facts of the palæontologist and of the physiologist, wonderful and interesting as they are, are merely the skeleton on which will grow, is growing even now, a whole living body of new social and moral beliefs.

It is out of our province to pursue this view of the subject; utterly impossible, at the same time, to refer to recent scientific progress without a side glance at its inevitable logical results. Avoiding that ground, however, and keeping to the purely scientific view of the subject, we cannot but be struck, quite apart from the practical interest of many scientific discoveries considered in detail, with the general effect of increased scale of everything, increased range of mental vision, which has been opened to us during the last fifty years. Through the "perspective glass" now presented to us by science we look back and around us, and are astonished at the way we have come and the distances that open out on all sides, and the unexpected relations we discern between phenomena once supposed to be isolated and disconnected. Time has stretched out behind us to immeasurable and almost unthinkable periods; epochs once regarded as distant are now but as yesterday; events which happen to-day, forms of life that are familiar to us, are shown to have their real originating causes in a past more remote than our fathers of the last generation ever imagined as existing at all; facts apparently, to the unscientific eye, unconnected with each other, are shown to be only links in a continuous chain of cause and effect. In some cases science seems to act by a kind of contrary motion; she pushes the object of our investigation farther from us than ever with one hand, while with the other hand she gives us the instrument that will enable us to bring it nearer than ever. With the parallax measurement she thrusts the fixed star into gulfs of space which can only be measured by the time occupied by the passage of their light to us; with the spectrum analysis she shows us nevertheless how that light can bring, after its enormous journey, information as to the chemical constituents of the body from which it emanates. This was one of the points touched upon in Sir John Lubbock's address as an example of the danger of limiting the powers of scientific investigation, since no less a man than Comte, as we had ourselves pointed out a fortnight ago, had assumed as a matter of course that of the chemical composition of the heavenly bodies "we could never know anything." Taken altogether, the retrospect of the last fifty years suggested by the President at this meeting of the British Association offers a wonderful and entrancing spectacle of what it is within the powers of man to understand and discover, and suggests ideas as to what the future may accomplish to which it is difficult to assign any limit; and those who imagine we live in a worn-out and uninteresting period may rest assured that they are either looking the wrong way or looking with their eyes shut.

We must descend, however, from the general to the particular in order to notice some of the special points which have been touched upon during the meeting that has just been held at York. We have already referred to Sir John Lubbock's address, which was a clear and concise survey of the scientific progress of the last fifty years, bringing out more in detail some of the remarkable steps in scientific knowledge to which we have referred in a necessarily cursory manner. The subjects touched on successively as those in which great steps have been made were partly of purely intellectual, partly of practical value. The "origin of species," the greatest step in natural science since the time of Newton certainly, was first referred to, and one or two of the popular fallacies in regard to it corrected. Then was passed in review the remarkable light thrown on the question of disease and its cure by the germ-theory of the development of disease, which grew, curiously enough, out of researches in reference to what most scientific men believe to be an entirely groundless theory,—that of spontaneous generation. The experiments made in this direction have had the result of destroying for the present all

the supposed grounds of belief in spontaneous generation, and at the same time, also, have had the very important result of bringing to light a great deal of unspontaneous generation where it was little suspected before, and of leading us to regard many diseases certainly, and all probably, as the result of vegetable or animal growths of a very minute nature, which may be destroyed by finding out and inducing conditions n which their deleterious life cannot be supported. Already some physicians, too sanguine perhaps, are talking of a not far-distant period when disease, no longer regarded as a kind of mysterious visitation of Providence, but as a parasitic growth possible only under certain ascertainable conditions, shall be "stamped out." Then from our own individual being we were invited to consider the structure and what may be called the diseases of the "*Grand Etre*," as Comte fancifully called the earth: a subject which was treated of more in detail afterwards in one or two sectional papers. From the earth it was a natural transition to the other bodies, among whom it plays a very insignificant, though to us all-important, part; and from astronomy again to the question of the meaning and composition of the light by which alone we are conscious of their existence. Here the President touched upon a subject which has much interest for many of our readers, the composition and relation of colours; and it may interest some of our correspondents who wrote to us not long since on the subject of colour, to know that as long ago as 1792 the common idea that red, blue, and yellow are "primary colours" was contradicted by Wünsch, whose theory is now generally accepted by scientists in colour, though long neglected; and Sir John Lubbock did not fail to emphasise the distinction, so entirely ignored by many, between colours and pigments, and to show that because blue and yellow pigments made a green pigment, it by no means follows that blue and yellow rays of light produce a green colour, which, in fact, they do not; and this part of the presidential address may afford to people who are sad by reason of the disrespect thrown upon their ancient and respectable theory of primary colours, some hint as to the direction in which to seek for scientific truth in a matter so interesting, theoretically, if not practically, to those whose business or profession it is to "lay the colours on," as we once heard an eminent painter describe his trade. Running over rapidly the principal practical scientific inventions of the half-century,—a remarkable list in themselves, and which could only just be touched upon,—the President summed up in claiming lastly for science that it had evolved and brought into being the very idea of "progress," which he affirmed was unknown to the ancients, and was only due in modern times to the mode of thinking induced by science. To this we must demur, as one of those too comprehensive generalisations sometimes made by scientific men, who look at all things in heaven and earth from a too exclusively scientific point of view. There is no doubt that the idea of the Darwinian theory has given a great impetus to the conception of a possible continual upward progress of the human race from higher to higher knowledge, and that this idea is [more prominent in the minds of men just now than it ever has been before, owing to the enormous vistas of possible discovery with which modern science has dazzled them. But we certainly are not in a position to say that the idea of progress was unknown to the ancients, or that a people who, like the Greeks, rose steadily through imperfect forms of art to the most perfect that has ever been seen, had not the conception of progress. But then progress in art, we fear, your true scientist thinks very little of; and that is just one part of the narrowness of the scientific mind,—not a petty narrowness, but a narrowness (if we may so say) on a great scale, against which those who are dazzled by the great power and aspirations of modern science need to be on their guard, remembering that, after all, scientific knowledge and acquirements appeal only to one-half of the human mind, and cannot in themselves satisfy a complete and imaginative nature. But that is just the mistake the prophets of science make, and for which another generation will probably to some extent take its revenge on them.

In glancing through some of the sectional subjects, and the suggestions involved in them, we take note here only of those which bear more or less on the practical subjects which are of special interest to ourselves. Artistic subjects, equally interesting certainly to us, do not, of course, come into the programme of the British Association. First among these subjects we come on Sir W. Thomson's address, as President of the Mathematical and Physical Science Section. This was a brilliant, — may we add, somewhat sensational?—*resumé* of the position in regard to available powers for driving mechanism. Coal, we were again told, was getting rapidly exhausted, though we cannot help thinking it has a longer lease before it than some authorities are willing to allow; rain-storage is entirely delusive as a means of accumulating power in any economical form; electric power is the power of the future,—all we want to work it is a cheap motive power, if possible utilising some natural and permanent force in nature. Cheap windmills, Sir W. Thomson thinks, we shall want, though he admits that wind is a somewhat uncertain agency,—more so, he seems to think, than formerly; and special means to supply the batteries would have to be provided for use in the event of calms. But another suggestion is to utilise Niagara for a large area,—say 300 miles round the site of the falls,—for supplying the power to drive powerful and numerous batteries for lighting the world by electricity. There, certainly, is an enormous power lying unused except as a spectacle. But what a chorus of complaint and objurgation would rise up at any serious proposition to turn Niagara into a huge mill-shoot. We doubt if public opinion would allow it to be done, and we can hardly say that we should not be on the side of public opinion; however, we do not anticipate being called upon to assist public opinion on the subject either one way or the other for a considerable time to come. The President of the Mechanical Section, Sir W. Armstrong, dwelt chiefly on the same subject, the utilisation of electricity, not merely in lighting, but as a mechanical power. The idea suggested chiefly in Sir W. Armstrong's address * was that of the possibility of converting the sun's heat into electric energy, which would give us an almost unlimited stock of power whenever the apparatus is forthcoming to produce the conversion. Until then, we must be content to use electricity for the most part not as a prime force, but as a result of force, or a means of conveying it; and in this connexion we observe he also speaks of the time when we shall have commenced the utilisation of waterfalls for this purpose as a time certainly coming and in fact not far off. We will not say that the result may not work for the greatest happiness of the greatest number, in which case its accomplishment, if materially practicable, is certain to follow sooner or later, but we cannot repress a feeling of sympathy with the many people who would feel keenly the transmutation of all the waterfalls into "powers." Their use in this way, however, and still more the conversion of the sun's heat into electric force, if it were ever accomplished, would at last be the realisation, practically, of the old baseless dream of "perpetual motion," though in a different sense from that in which it was sought for by the dreamers themselves. Persons who are sensitive on the subject of the English climate may be amused at the idea of evolving anything like "perpetual" motive power from the heat of the sun in this country; but it must be remembered that we should now be able to calculate, or at least it seems probable that we should, on the transmission of power to great distances, not only by the electric current, but by the further development which may be expected from Faure's accumulator as a facility for the storage of "force."

The utilisation of the electric light, which meets us at every turn and in every form at present, was further illustrated in what appears to be an already practically realised success, in the interesting account given by Dr. Siemens in his paper communicated to the Physical Science Section. This was a description of his experimental introduction of electric light in his own greenhouses, with the view of ascertaining whether the lighting up of the plants with this light between sunset and sunrise, imitating as far as possible the effect of continuous sunshine, would promote more rapid and fuller growth. The results, according to his account, are exceedingly remarkable and unexpected. It would be the natural conclusion, we imagine, of most people, that the interruption of the regular recurrence of darkness would be such a violen change from the general conditions of vegetable growth as to be injurious rather than beneficial. And it appears that in the first instance the effect of the naked light on the plants was decidedly injurious, and the plants soon showed a withered appearance. One attempt to reduce the direct effect of the light was by introducing into the house jets of steam drawing atmospheric air with them, and thus imitating the effect of interposed and passing clouds. This effected an improvement, but subsequent experiments showed that a still better result was obtained by merely interposing a sheet of clear glass between the light and the plants, and that under these circumstances the plants throve remarkably, and, in fact, abnormally. So marked was the effect of the glass that when a small sheet was interposed so as only half to screen a plant from the light, the line of demarcation between the part illuminated by the naked light and that screened by the glass was distinctly visible on the leaves of the plant. This seems to show that the deleterious effect of the light was chemical; but to us the interest of the experiment lies in the conclusion which it seems to point to that, recognising the strong analogy between life and growth in plants and in animal organisms (indeed, modern science hardly draws a line between them in some respects), the far greater use of strong artificial light such as the electric light need not in the end be expected to produce any ill results on human life; and, in fact, that the idea of the necessity of periods of darkness is a habit which may be broken through with a little effort without injury to organic life. As we do not yet know to what lengths the use of electric light may eventually be carried in turning night into day, it is certainly very significant to find that plant life, at any rate, seems rather to gain than to lose by this change of its conditions, extreme as it seems. It would be strange if science were in the end to lead to the practical conclusion that such an important procedure in nature as the alternation of light and darkness on our planet was after all no essential condition of healthy life, but a kind of prodigious accident, the loss of which would leave us in reality little altered! The necessity in animal life for regularly recurring periods of rest would of course remain. In the mean time the practical results in regard to vegetables seem to be actually appreciable in more rapid and luxuriant growth and therefore more economical use of the greenhouse. Where may, or, rather, where may not, this end? Already Dr. Siemens hints at the possibility of the gardener actually having, practically, the alteration and variation of the seasons at his command. The possible (may we not say, highly probable?) part to be played by electricity in the locomotion of the future was strongly emphasised also not only in Sir W. Armstrong's address before referred to, but in one by Sir F. J. Bramwell on the developments of mechanical engineering during the last fifty years. He concluded by referring to the steam engine as already almost a thing of the past, and doubted whether those who would meet fifty years hence would find them except in museums. There is unquestionably, however, a good deal to be done before a locomotive agent so swift, powerful, and tractable as the locomotive engine of to-day, will be realised in any other form.

We may conclude by reference to a paper which, though dealing with a much smaller subject than those we have been referring to, touches especially on our province. This was Professor Owen's address as President of the Zoology and Botany Department, which consisted of a full and very racy account of the initiation and subsequent history of the National Natural History Museum. The story told by Professor Owen is instructive in regard to what may be gained by resolutely sticking to one's point even against apparently hopeless odds. Professor Owen's large scheme, demanding a site ten acres in extent, was condemned not only by a Parliamentary Committee (which would not go for much), but by a number of the most eminent scientific men of the day, the Professor standing quite alone in his recommendation of the scheme. The objections to it were partly economical, partly due to a theory, perhaps to some extent founded on the other objection, that so large a collection was only bewildering and cumbersome, and of no real use for purposes of instruction. Professor Owen has now, however, got, if not his ten acres, at least eight of them, and he may rightly feel gratification in remembering, as he

* The pith of this paper, and of others most likely to interest our readers, we print on other pages.

says, that his sole responsibility for the scheme is recorded, though in expressions more terse than complimentary, in the pages of that voluminous publication which, he suggests, may outlast the organisation of the body whose debates it records. In the course of his address Professor Owen spoke with admiration of the thorough manner in which Mr. Gladstone went into the question when it came before him while in office, going personally into every corner of the department in the British Museum, cellars included, and seeing everything for himself; and he also expressed very warmly his praise of the new building and of the ability shown by Mr. Waterhouse in its arrangement and architectural treatment, in which few of our readers will disagree with him.

Electricity, however has been the central subject of this meeting of the Association, which has been a very brilliant and interesting one, and which suggests far more topics for reflection and expectation in regard to the future than we have been able to touch upon here. To some of these we may return.

1881: A GREAT CENTENARY FOR ENGLAND.

THE celebration of centenaries is a habit which, in many cases, would to our mind be better honoured in the breach than in the observance,—the link between the lapse of a century and the event commemorated as being a century old being usually one of a purely arithmetical order. The year 1881, however, observed or not, is a centenary of the first importance to England. The present year marks the close of the first hundred years of the actual existence of that invention which has done more, not only than any other, but than all others, to revolutionise the relation borne by man to the planet which he inhabits. "In 1781," said Sir John Rennie, in his address to the annual general meeting of the Institution of Civil Engineers on the 20th of January, 1846, "Watt invented the means of producing rotary motion by the steam-engine, first by the crank, and afterwards by the sun and planet wheel, thus rendering it applicable for the purpose of driving all kinds of machinery, which was a grand step towards the improvement of manufactures." In fact, this simple and beautiful invention has been to the steam-engine, generically, what the blast has been to the locomotive, specifically. It has supplied the one practical link between the source and the application of motion, without which mechanism would have been imperfect and clumsy. For the honour of inventing the steam-engine there are many claimants. In 1698, it was first rendered, by Savery, an efficient means of raising water. In 1712 it was actively employed for that purpose, by means of a steam cylinder, into which cold water was injected for forming a vacuum, so as to enable a movable piston to be impelled by the pressure of the atmosphere, to which, by the use of a lever, a pump for raising water was attached. In 1713-8 this pump was so improved as to be made self-acting; but the consumption and expense of fuel were so great that its application was very limited. But while Watt, from 1777 to 1782, was perfecting his idea of the application of steam, with expansion and with double action, above and below the piston; while, in 1784, he invented the parallel motion, working gear and valves, the governor, and other important details, which were brought together in the machinery for the first steam mills, the Albion Mills, in 1784,—the inland navigation of England was being adapted for the distribution of fuel, at low prices, in every district that was served by a canal. In 1758 Brindley was withdrawn, by the Duke of Bridgewater, from his occupation as a millwright, for the purpose of executing the Bridgewater Canal. In conjunction with Smeaton and others, he subsequently executed, with great success, the Trent and Mersey, the Leeds and Liverpool, the Birmingham, and the Forth and Clyde canals: works that remain as lasting monuments of his skill and genius in this branch of the duties of the civil engineer. Our canals had only been dug to an aggregate length of about 4,000 miles (4,138 we make to be the nearest approximation to exactitude that is obtainable), when the railway companies began to struggle for a traffic which they had far better have left to the canals. At the present time, 1,716 miles of canal have been purchased, leased, or otherwise acquired by the railway companies, which have now obtained the command of the inland coal traffic; although the open highway of the sea has happily prevented the existence of the monopoly sought for by the struggle.

The opening of our coalfields was the immediate result of the creation of our canals. The ready and cheap transport of coal gives to the steam engine that food on which its economic value depends. The average consumption of coal, per indicated horse-power per hour, in steam ships with compound engines in long sea voyages, averages 2·11 lb. (Manual of Rules, Tables, and Data for Mechanical Engineers, p. 889). The performance of some of the most powerful railway locomotives has been measured as 2·28 lb. of coal per horse-power per hour, ascertained by load and speed. The gross work done on a piston by 1 lb. of steam varies, in round numbers, from 56,000 to 62,000 foot pounds, equivalent to from 72 to 80 units of heat. This work rises, by the use of expansion, to as much as 150,000 foot pounds, when expanded about six times, and cutting off about 10 per cent. of the stroke. Even under the most favourable circumstances, only 20 per cent., or one-fifth part, of the heat consumed is converted into work. The highest duty recorded in the Cornish mines, where great attention is paid to this subject, was 108,000,000 pounds lifted 1 ft. high by the consumption of a bushel of Welsh coals, weighing 94 lb., at the United Mines, in 1842. This is equal to nearly 1,149,000 foot pounds of work done by the consumption of 1 lb. of coal. Taking this as a result possible with the best fixed machinery under the most advantageous circumstances, and comparing it with the former result of about 2¼ lb. per horse-power per hour applied to locomotion or navigation, it is evident that one quarter of a cwt. or 28 lb. per horse-power per day of ten hours, is a very attainable result for a good steam-engine. At 300 working days per annum this is equal to 3·75 tons of coal per horse-power per year. To allow for waste and mismanagement, let us say five tons. The average price of this, at the pit's mouth, is from 5s. to 7s. per ton, or a mean of 30s. plus the cost of carriage of the fuel, for the cost of a horse-power for a year.

It was estimated by Mr. Cossham, a coal-owner of experience, in 1877, that 23·50 per cent. of the coal raised in Great Britain was used in raising steam for manufactures, and another 4 per cent. for steam and railway locomotion. Returns of the coal raised do not go back further than the year 1854, when the total output was 64,660,000 tons. From the proportion borne by the product of the South Wales coal-fields, of which the yield in 1800 is known, to the whole produce of the United Kingdom, we estimate the yield of 1800 at 16,666,000 tons. At that time, however, the allowance for steam-locomotion and navigation was not required. For manufacturing purposes alone, Mr. Cossham's rule would give a consumption of 3,915,000 tons of coal in 1800, and our rule would make this represent a force of 781,000 horses. In 1879 the out-put of our collieries is returned at 133,800,000 tons. The proportion assignable to steam-power is 36,795,000 tons. The equivalent power developed is that of 7,359,000 horses.

Such, then, is an approximate statement of what the genius of the engineer has done for England. If we name James Watt as the foreman of the goodly company in which Smeaton, Brindley, Telford, George and Robert Stephenson, Mark and Isambard Brunel, and so many others, have been fellow workers, it is not with the idea that merit can be thus personally distributed. If we speak of the birthday of the Crank, it is only as one of the simplest and most beautiful details, mechanically speaking, which have been combined to allow of the present wonderful organisation of the steam-engine. With that reserve, the centenary of the birthday of the crank is one of the most important that has ever occurred in the annals of England. It measures a century of progress such as the world never saw before. And it commemorates an invention which has placed at the service of England,—a service not negligently exacted or performed,—a force greater than that which could be exerted by seven millions of horses.

It would be of great national service to obtain a census of the steam engines of England. The only element for such a statement which exists is the return of railway locomotives. In 1879 there were 13,174 of these engines on the railways of the United Kingdom. A powerful passenger engine, on the Great Northern Railway, was stated, in a discussion at the Institution of Civil Engineers, on the 11th of November, 1873 (see vol. xxxvii. of the Proceedings), to do the work of 678 horse-power. It is not usual to state the work of the locomotive in horse-power, as so much depends on the speed at which it is driven. But if we take less than half the Great Northern power, say, for the sake of simplicity, 333 horse-power per locomotive, we find these machines to represent a power equal to that of 4,386,942 horses. That, of course, is a statement not of work done by them, but of the work which they are able to perform, if all at work at the same time, and to keep up, if supplied with fuel, burning rather less than 28 lb. of coal to the mile run.

As to the actual horse-power of our steam fleet, no returns exist. There is, moreover, a very great difference between the nominal horse-power and that at which the same engines are capable of being worked. Thus, the *Scythia*, one of the Cunard line of packets, with a builder's measurement of 4,566 tons, has compound direct-acting engines of 600 nominal horse-power, which are capable of being worked up to five times that amount, or 3,000-horse-power. In our war fleet, where great speed is required, the indicated horse-power is at times as much as or even more than 1-horse-power per ton. The *Plucky*, a little vessel of 198 tons displacement, has a steam power of 224-horse-power. The *Pickle*, of 254 tons, has 268 i. horse-power. Among the larger vessels, the *Agincourt*, with a displacement of 9,071 tons, has a steam-power of 6,867-horse-power. The *Inconstant*, with 5,328 tons displacement, has 7,361-horse-power. The *Sultan*, with 8,714 tons displacement, has 8,629-horse-power. The *Hotspur*, a twin-screw vessel, with 3,980 tons displacement, has 3,497 i. horse-power. Mr. Clement Mackow, in his excellent "Naval Architect's and Shipbuilder's Pocket-book," gives a table of the co-efficients of performance of fifty of her Majesty's screw vessels. Of the eleven items which are tabulated, there is but one column in which anything like regularity is maintained. That is the column headed $\frac{V^3 \times D^{\frac{2}{3}}}{H}$ by which formula is signified the cube of the velocity, multiplied by two-thirds of the displacement, and divided by the indicated horse-power. But the values even in this column vary from 94·9 to 289·6. If we take the figures 175 as a mean for this column, we find that for a mean speed of ten knots per hour, 380 i. horse-power are required for every 1,000 tons of shipping. The total number of steam-vessels registered as belonging to the United Kingdom at the end of 1880 was 5,247 (or four times the number of the locomotives on the railways), with an aggregate tonnage of 2,723,468. The approximate rule which we have ventured to formulate, and which we think will be rather under than over the mark, makes the steam-power required for this tonnage amount to a force of 1,033,000 horse-power. But there can be but little doubt that if the method adopted by Mr. Robinson were applied, and if the actual resistance overcome by the steam fleet were calculated in horse-power, we should arrive at much larger figures. According to the Navy List, the Royal Navy contains 993,748 tons of shipping, N.M., and 679,473 H.P. The combustion of 3,000,000 tons of coal, which is probably a low estimate for the coaling of the mercantile navy, would represent a force of 600,000 horses,—but one in constant exercise for ten horses per day, and for 300 days in the year. The difference between the potential and the actually exerted steam-power of steam-vessels, as well as of locomotives, is enormous; and the same may be said with reference to the vast stationary steam-machinery of the country, the estimate for the coal consumed by which, in 1869, was nearly six times as much as that required for the purposes of navigation and railway locomotion.

The Coming Social Science Congress.—As already announced, this year's Congress of the National Association for the Promotion of Social Science will be held in Dublin from the 3rd to the 8th of October. The Right Hon. Lord O'Hagan, Lord Chancellor of Ireland, will be the President of the Congress. The President of the Health Department will be Dr. Cameron, M.P., while the Right Hon. Viscount Powers-court will preside over the section devoted to the discussion of Art questions.

BUILDING AND DECORATION IN VIENNA.

IN our last notice on building in Vienna,* we omitted mentioning the progress of the new Palace of Justice, an edifice the erection of which was commenced as early as 1875, and which is now rapidly approaching completion. We gave some particulars of the building, together with an interior view, in the *Builder* of September 14, 1878, and we are now able to furnish some additional details, more especially with respect to its decoration.

The estimate of the architect, A. von Wielemans, is three million florins (250,000*l.*). The building is to receive the supreme court of justice, the court of appeal, the court for civil cases, and the tribunal of commerce. The vestibule will have a height of 29 ft. 6 in., and its ceiling will be supported by twelve columns of Untersberg marble. This entrance leads into a central hall of rather gigantic dimensions, being 82 ft. high. The public courts are in the first story. The lobby of the supreme court is a hall 98 ft. 6 in. long, round which are offices. The plans for the new *Justizpalast* were exhibited in the summer of 1874, the designs being in all possible and impossible styles of architecture. The jury selected that of Wielemans, a young and until then little known architect (one of the most talented disciples of van der Nüll, Sickardsburg, and especially of F. von Schmidt, the cathedral architect), who was finally entrusted with the direction of building operation in September of the same year. The colossal edifice, the foundations of which, as we have already said, were begun in 1875, and which is one of the best architectural monuments of Vienna, is now nearly completed in all its details, and covers an area of 93,000 square feet. The architect selected the German Renaissance style, embellishing his work by a wealth of interesting details, the whole conception testifying to considerable genius. The portico is reached by fliers with convenient ascent, on the flanking pedestals of which sculptured lions will ultimately be placed. The principal façade of the two-storied building is marked by a powerful pediment and two turrets. Over the principal portal, in the pediment, a colossal figure of Austria, by Helmer, is placed, in effective contrast to the dark background of the niche in which it stands. The free space in front of the Palace of Justice is unfortunately of a trapezoid form, but it is intended to mask this eyesore by suitable garden grounds.

The interior of the building is full of well-conceived and tasteful architectural and decorative details. Amongst these may be mentioned the pedestals of the columns, richly sculptured by Pokorny, as well as all the lanterns, candelabra, door-railings, balustrades of wrought iron, the splendid oak doors, wooden panels, &c. It is soon perceived that everybody engaged in the work has tried to do his best. The art industries of Vienna have shown on this occasion what they are able to perform; but it should be mentioned that the architect has been ably assisted by coadjutors, such as the Cologne architect Dominik Asanzo, the engineer Arthur von Wielemans, and others. If the exterior of the edifice appears clearly and well defined on the whole as well as in detail, the interior is well lighted in all the rooms and convenient in its communications. We proceed now to describe the principal rooms.

The vestibule is carried through two stories, and is a splendid space, with a ceiling supported by columns. The shafts are of reddish Salzburg marble, the bases being in Grusignano marble richly carved. The centre of the ceiling is adorned by a slab, carried by two decorative supports, with the inscription "Justitia regnorum fundamentum" (the well-known motto of the Emperor Francis I.). Next to the vestibule is the great central hall, also a grand room, carried through all the stories of the building, which explains its great height of 82 ft. before mentioned. The soft shades of the painted-glass ceiling harmonise pleasantly with the various colours of the marble and granite. The arcades of this hall, which is, properly speaking, a court, are supported by handsome square pillars on the ground-floor, in the first story by columns of red Pavenno granite, the second story being a mezzanine. A principal object in this hall is presented by the stairs facing the entrance, with steps of Salzburg and balustrades of Trient marble, the latter with open-work ornamentation. In the spandrels of the first gallery the coats-of-arms of the Austrian crown-lands, carved and coloured, have been inserted. Above the stairs, in a niche flanked by double columns and surmounted by the imperial coat-of-arms, a symbolic female figure, 10 ft. high, and representing Justice, has been placed. It is in Laas marble, and is the work of Pendl, a Viennese sculptor.

These stairs lead to the principal courts in the first story, and to all the other rooms. The most remarkable one is the great court, carried through two stories. The funds for the frescoes, to be painted by Professor Eisenmenger and Julius Berger, have not yet been provided, and thus the "Functionssaal," as it is called, is devoid of all ornamentation, and will be used for a little while in its present white garb. The busts of the Austrian Emperor and Empress are the only decoration of the room. They were presented by the Vienna Chamber of Advocates. At the back of the principal stairs is the Advocates' Hall, which contains a handsomely-carved ceiling and wainscoting in the German Renaissance style. The fittings of the room, desks, tables, chairs, &c., though richly carved, are in keeping with the whole character of the edifice. The so-called "Plenissimum," or principal hall of the supreme court, is perhaps the most splendidly-decorated room of the building. It also has a carved wooden ceiling, in the centre of which an imperial eagle, 10 ft. in diameter, extends his wings. A frieze, painted by Jobst, and containing a series of portraits of Austrian emperors, runs round the room. Above the judge's seat, opposite the entrance, is the portrait of the present emperor, painted by Berga. The library, containing 10,000 volumes, is to the left of the supreme court. It has likewise a carved ceiling, a gallery of wrought iron, and neat desks and book-cases with brass screens. To the left of the library is the principal room of the court of appeal, adorned like the Plenissimum. The remaining public courts are arranged and fitted up on similar principles.

There remains yet to be mentioned the great lobby in the outer wing of the building, facing towards the Reichsrathplatz. Its ceiling is supported by double columns of grey Karst marble; its frieze bears the imperial family arms; over the entrances to the different courts have been placed such judicial emblems as sword, scales, fasces, &c.; marble tablets display the names of all chief judges, or judge-presidents, from the time of Maria Theresia to the present reign. On the occasion of laying the foundation-stone, which took place quite recently, after the building had been far advanced, the various speakers were full of praise respecting the new palace of justice, by the erection of which the Austrian capital has acquired another highly artistic and monumental edifice. Its builder, Alexander von Wielemans, has by his work at once established a reputation as one of the foremost architects of the Continent.

When we spoke of the progress of building and decoration in Vienna last, it was stated that the carriage approach to the new Houses of Parliament, as originally planned, would have to be abandoned. We now learn that the matter has been satisfactorily settled. Without trenching upon the area of the Ringstrasse, to be avoided at any cost, the approach will have a rise of about 1 in 20, and end in a semicircular terrace and stairs leading to the entrance. The approach will be brought out to the Ringstrasse, the level of the terrace lowered, and the entrance to the portico gained by stairs of seven steps. A large monumental fountain is to be placed in front of the approach and terrace.

Another matter of interest in Viennese art circles is the enlargement of the "House" of the Vienna Society of Artists, which was recently unanimously resolved upon at a general meeting of its members. It is believed that 250,000 florins will cover all building expenses. The society's house is to be extended towards the garden, of which a portion will be appropriated. Provisional plans have been prepared by the architects Streit and Schacher. It is proposed to erect a one-story building, joining the two back corner pavilions, and forming a parallelogram facing the Lothringer Strasse. A small court will be provided in the centre of the new wing. The Künstlerhaus will gain by this addition two rooms, lighted from above, each 85 ft. 6 in. long, 21 ft. 6 in. wide, and 20 ft. high, with a wall-space of about 4,300 square feet, and two galleries containing a wall-space of about 1,800 square feet each. The court will have two loggia for the reception of sculpture. When the project of the extension became first known, it seemed as if the owners of surrounding property would prove troublesome. But it was soon found that, even if the enlargement had included an additional story,—the old building is only two stories high,—the proposed addition would not have interfered with their outlook. Besides, any addition made could not well exceed the original height without spoiling the leading idea of the designer of the Artists' House, the late architect Weber. The enlargement has become absolutely necessary. When the House was first erected, it was thought that ample room had been provided for all emergencies; but since international art exhibitions have become the fashion, this supposition has proved to be fallacious and the space at disposal quite inadequate for such extended exhibitions.

Some life has recently been imparted to the building operations at the new University, which at one time seemed almost to have come to a standstill. They are proceeding now more actively; and although the building is still far from having assumed its final form, one is able even at this point to say that it will be a splendid edifice. Carved work and sculpture is making its appearance here and there; but the principal part of the adornment is awaiting execution. The courtyard of the University, with its arcades in the high Renaissance style, will be one of the largest and handsomest courts of the new buildings of Vienna. The walls of the arcades, simply ornamented, are in Groisbach stone. In the courtyard itself a monumental fountain will be placed. The arcades will receive frescoes, surrounded by rich stucco frames, and representing the development of the sciences. Several other spaces,—for instance, the vestibule, staircase, &c.,—will receive stucco work. The execution of the latter, and of all details, will be proceeded with slowly and piecemeal, so as to test their effect before completing the whole. The plastic decoration generally will be in various materials, stone, terra-cotta, and majolica. The statuary will be in the first-named material; the figures in the spandrels are to be in terra-cotta, the medallion portraits of majolica, white and blue with gold framing. Above the great pediment of the principal façade the figure of Nike or Victoria will be placed; in the pediment itself the birth of Athene (Minerva) is to be represented. The latter subject will be treated by Professor Tantenhayn. In the attics of the pavilions are to be placed figures representative of Medical Science, Jurisprudence, Philosophy, Theology; next to them will be ranged subjects representative of special branches of science, such as biology, civilisation, Bible study, &c. The side façades will be adorned by statues of mythological personages, amongst them Hermes (Mercury), Thalia, Apollo, Clio, Gæa, Neptune, Prometheus, Urania, Orpheus, &c. In the niches of pavilions of the first story the following figures will be placed:—Plato, Artistotle, St. Peter, Moses, Solon, Justinian, Hippocrates, Galenus, Charles the Great. The medallion-portraits will be those of Pliny, Erasmus, Descartes (Cartesius), Leibnitz, Newton, Galileo, Copernicus, Kepler. The tablets will contain the names of Kant, Lessing, Winckelmann, and other well-known names. Amongst the artists who will execute those works may be mentioned Rud. Weyer, Wagner, Jos. Gasser, Edm. Helmer, J. Berger, David, Silbervogel, &c. It is said in praise of the building that it will, when completed, display a harmony of architecture and the decorative arts seldom to be met with.

As if Vienna had not theatres enough already, another is to be added to the large number of playhouses possessed by the Austrian capital. Only three of them (of which two receive subventions) pay at all; the others eke out a precarious existence. But the latest addition, plans of which have already been prepared, and which is to be placed in the growing suburb of the "Landstrasse," is to be something quite out of the common. In its interior it is to resemble the well-known "Théâtre Eden," Brussels, and will combine within it winter gardens, refreshment rooms, lobbies, galleries, atria, loggias, &c. A peculiarity of the new theatre will be that from all these various places the performance may be witnessed. The promoters are an Antwerp Company, and the theatre is to be named the "Théâtre de Vienne." The plans have been prepared by the architects Wilhelm Kuhnen (the builder of the Théâtre Eden, Brussels) and Wilhelm Stiassny (Vienna). The building will

* See *Builder*, vol. xl. (May 21, 1881), p. 626.

have a length of 279 ft. and a width of 197 ft., and will be especially constructed and fitted up for the performance of sensational and historical pieces, transformation scenes, ballets, &c.

THE RIGHTS OF VENDORS AND PURCHASERS OF BUILDINGS IN REGARD TO EXISTING FIRE POLICIES.

It is a curious fact that points of a comparatively elementary and everyday kind in regard to the law, which, it might naturally be supposed, would have long ago been settled, are continually cropping up. It is so in regard to this question of the rights of vendors and purchasers of buildings with reference to existing policies of fire insurance. To those who are concerned with buildings professionally or as investments few questions can be more important, and we confess that it is a matter for regret that in regard to one special and interesting point it is impossible to consider the subject as being in a thoroughly settled state. It may be well, first of all, to point out that, as a general rule, a purchaser does not get with the property any policy of insurance which exists upon that property; about this there can be no doubt, as the policy is a contract between two persons, the rights under which cannot be conveyed to another without an express agreement to this effect.

But the immediate question is not quite so broad as this, but it arises in this way: An agreement for the sale of a house is duly entered into, but, as usually is the case, a certain time is to elapse before the actual conveyance is executed and the purchase-money is paid to the vendor. If at the time at which the completion of the matter should take place, the purchaser is ready with the money, but the vendor will not complete his conveyance, the Chancery Division will, as many of our readers are aware, enforce the fulfilment of the agreement. But let us suppose that between the date of the agreement and the time for the completion of the bargain the house is burnt, and that there is an existing policy of insurance on it, and that the vendor receives the amount due from the insurance company. These are the facts which actually occurred in the recent case of Rayner *v.* Preston (50 *Law Journal*, Chancery Division, p. 472), a case which gave rise to much discussion both before the Master of the Rolls and the Court of Appeal.

Under such a state of things as this, the question,—one which it will be immediately perceived is of great practical importance,—arises, Does the vendor hold this money recovered from the insurance company for his own benefit, or is he bound to hand it over to the purchaser? In other words, does he receive it as a trustee for the purchaser? Having regard to this last case, it must be answered that the vendor may keep the money himself, and leave the purchaser the pleasure of repairing the damaged premises out of his own pocket. This was the conclusion arrived at not only by the Master of the Rolls, but by Lords Justices Brett and Cotton, as against the late Lord Justice James, who was of a contrary opinion. But, having regard to the great judicial value of the late Lord Justice James's opinion, it cannot be said that the law is in a thoroughly settled state, although a lawyer could give a confident opinion that until this case is reversed by a higher tribunal it is binding on any inferior court. And while upon this point, it may be well to point out that an unpaid vendor may recover from the insurance company; but whether, if the money were not expended on the building, he could keep it as against the company, is a matter of doubt, for after the judgment in the case of Rayner *v.* Preston had been delivered, Lord Justice Brett remarked, "I should like to add to what I have said, that I feel very considerable doubt indeed whether, as between the defendants (the vendors) and the insurance company, the defendants (the vendors) can keep the money." And in this doubt Lord Justice Cotton concurred.

Upon the main question, however, with which we are now chiefly concerned, few can doubt that in natural justice the purchaser should have the benefit of the money which the vendor recovers, and there is great force in the remark of Lord Justice James that "the policy of fire insurance is not a wagering contract,—a contract that if a fire happens then a certain sum shall be paid to the insurer; it is in terms and in effect a contract that if the property is injured the insurance company will make good the actual damage sustained by the property. That damage, and that damage only, gives the right, and is the measure of the right, to recover from the company." And the late Lord Justice, at the conclusion of his judgment, thus succinctly summarises his general opinion on the question,—"The relation between the vendor and purchaser was in law as from the date of the contract the relation of trustee and *cestui que trust*, and the trustee received the money by reason of and as the actual amount of the damage done to the trust property." But though our sympathies may go with the dissentient Lord Justice, it is difficult to overcome the reasoning of the other judges, who point out that the contract between the vendor and the insurance company was a purely personal one for the payment of money on the happening of certain conditions. Further, Lord Justice Cotton states, "the argument that the money is received by virtue or in respect of property which is trust property is, in my opinion, fallacious. The money is received by virtue or in respect of the contract of insurance, and though the fact that the insured had parted with all interest in the property insured would be an answer to the claim, on the principle that the contract is one of indemnity only, this is very different from the proposition that the money is received by reason of his legal interest in the property." It would be presumptuous for us when such able and distinguished lawyers are divided upon this question, confidently to give our opinion. But we confess that we are inclined to side with the majority on this occasion; nor do we know that the purchaser is so very much entitled to our sympathies for not getting the benefit of the policy existing on the buildings. For let us point out these facts. If there had been no contract of sale in existence, and the owner of the house, having received from the insurance company the amount of the damage done to the building by fire, had chosen not to reinstate it at all, or in a way which cost half the amount he received from the company, he would have been entitled to pocket the whole of the difference. The insurance company would not compel him to build up his house again if he preferred to have the money. Let us also suppose that there had been no insurance existing in the present case, and that the house was damaged to the extent of 500*l.*; the purchaser would have had to take it damaged to this extent, and worth less by so much than when the contract was made, without getting any corresponding diminution of the purchase-money. That being so, why should the mere chance of a policy existing place him in any better position as regards the vendor of the house, and why should the latter not exercise the option which he before possessed of keeping the money in his pocket or of repairing the house? It is true that no right-minded man would hesitate to hand over the sum received from the company to the buyer; but, looked at without regard to feelings, what right has the buyer to expect the seller to make him a present of this windfall, for such it would be to the vendor? If the purchaser wishes to be safe, he should make an express stipulation with the vendor that he shall have the benefit of any existing policy upon the buildings which are the subject of the contract. And the moral for practical men of business which is to be drawn from this decision is, that in all cases the purchaser should stipulate for the benefit of any existing policy, and, if the building is not insured, should insist that the vendor shall take out a policy of which the purchaser shall have the benefit, and then the latter will be in a perfectly safe position.

SAVE THE CORN!

COLONEL COXON in the *Times*, and another writer in the *Morning Post*, are reproducing a suggestion which we made some years ago in the *Builder* as to the desirability, in very wet seasons, of saving at least the ears of corn, leaving the stalks for treatment when weather would permit. Our own proposal was rather fiercely combated by a correspondent who spoke as a practical farmer. On all such questions there is a certain weight that attaches to the opinion of the man of practice as compared with the man of study. On the other hand, all improvements of all kinds have been improvements *on* practice, and have met with more or less opposition, not because they were not improvements, but because they were new. We therefore content ourselves on the present occasion with bringing the subject under the attention of those chiefly interested. But where, we may ask, is the apparatus for artificial drying of the corn, of which we heard so much a year or two ago? Speaking from memory, the inventor wrote to us to say that he had spent all that he could spend in promoting a great national object; that his success was assured, so far as proving the possibility of effecting that object was concerned, but that his heart was nearly broken by the want of interest which the public displayed. If ever there was an occasion on which mechanical harvesting needed to be supplemented by mechanical drying or ripening, it has been in the present season. Not till the very time of harvest did the rain fall. That, when the golden crops had so far matured, their promise should be frustrated by rain, is, in our opinion, a reproach and a scandal to our boasted civilisation. There are times when no human effort could make up for the inclemency of nature. But to lose the harvest, or any considerable proportion of the harvest, of 1881, is to incur a preventible evil,—that is to say, an evil which, whether prevented or not, could have been and ought to have been prevented by the application of known methods. A few hours of drying wind give some small comfort as we write. But again we ask,—Where are the inventions that promise to save and to dry the corn crop?

As the above was written, a notice in the columns of the *Morning Post*, calling attention to the hay-dryer, the invention of Mr. W. A. Gibbs, caught our eyes. By the process, the writer states, wheat, when seemingly worthless, can be restored to wholesome food, almost equal to malt for fattening. A report is quoted from the agent of the Duke of Northumberland as to the effect of the machine in drying hay, which seems to be its original object. The report states that colour and aroma are preserved, and that the hay is not scorched. Two tons an hour is the rate of drying. How far this applies to wheat, and what is the proposed application with regard to the wheat crop, we should be glad to hear. Can Mr. Gibbs give any facts showing the cost and the time that it would take to dry, in the sheaf, a hundred quarters of wheat? That is the way to put the case, as a matter of business.

THE ST. GOTTHARD RAILWAY.

THE SIMPLON AND MONT BLANC TUNNELS.

THE hundred and third report on the progress of the works of the St. Gotthard Railway, reaching to the end of the first half of this year, has just been published, and from it a very interesting picture of the state of this important undertaking may be drawn. The principal and most difficult work, as we are aware, is the tunnel through the St. Gotthard, of a length of 16,304 yards, or nine miles and a quarter. Its adit level has been driven this year, and more; the tunnelling has proceeded for 13,215 yards, and been completed for traffic for 12,174 yards. No fewer than 3,319 workmen are employed in the tunnel, work proceeding uninterruptedly night and day. The contract value of the work done is 2,180,000*l.*, leaving still to be finished work to the value of 85,000*l.* The quantity of compressed air used during the month of June for the rock-boring machines and the locomotives employed in the carriage of materials and *débris* was 5,981,444 cubic feet per day. The temperature in the centre of the tunnel was 29½ degrees C. (85 Fahr.), or 17 degrees more than outside the tunnel. The quantity of dynamite used daily was 567 lb. It may be remarked, in passing, that the temperature in the interior of the tunnel may possibly become lower, as has been the case in the Mont Cenis tunnel, where it has fallen 7 to 8 degrees C. during the last ten years.

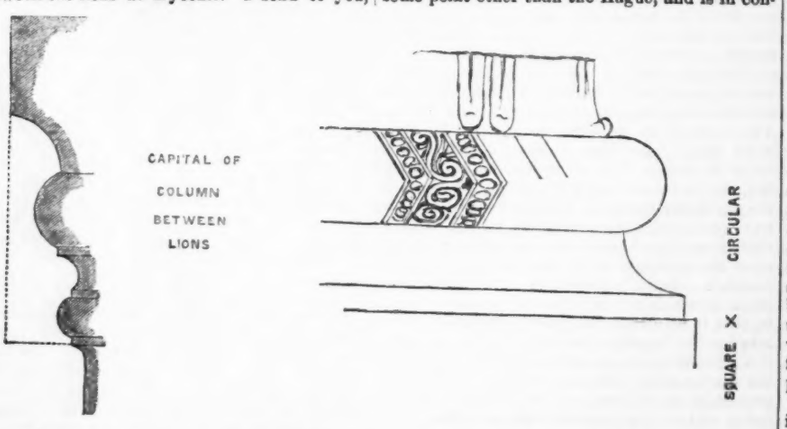
On the feeders of the St. Gotthard tunnel, of a total length of ninety-nine miles, and including the lines Immensee-Göschenen, Airolo-Biasca, Cadenazza-Pino, Giubiasco-Lugano, of the calculated 170,486,224 cubic feet of earth and rock, 91 per cent. had been removed or levelled; of the 10,085,512 cubic feet of brickwork and masonry, 83 per cent. had been executed by the end of June. Of the roadways of the fifty-one tunnels, of a total length of fourteen and a half miles, 89 per cent. had been completed. The fact that of the permanent way only 13 per cent. had been laid down has its explanation in the still numerous obstacles. But the above data show unmistakably that the great work is rapidly approaching completion. Within a very short space of time—it may be another year—

Germany will reap the fruits of the energetic efforts made by the representatives of the then North German Confederation at the Bern Conference in the autumn of 1869. The financial sacrifices made by Germany appear trifling compared with the advantages to be gained.

In the meantime, France is preparing to meet the threatening competition by substantial subventions towards the Simplon Railway. If the Mont Blanc project, born of and advocated for locally patriotic reasons,—according to which the northern entrance of the inevitable great Alpine tunnel would lie in French territory, instead of, as in the case of the Simplon tunnel, on Swiss soil,—had not come between as a disturbing factor, the Simplon Railway would, at this moment, have passed the introductory stages of construction. On the north side a completed railway reaches to the foot of the Simplon, at Brieg, in the Rhone valley, which at Lausanne and Geneva joins on to the great North Alpine railway network. On the south, the continuation of the Upper Italian Railway as far as Domo d' Ossola has been secured. There remains, therefore, only the mountain portion (10½ miles long, and estimated at 675,000*l.*) on the granite slopes of the Diveria, from Domo d' Ossola to the southern entrance of the Simplon tunnel at Isella. The latter will be 11½ miles long, consequently exceed that of the St. Gotthard by 2½ miles, and has been estimated, including the cost for the northern approach and an international terminus at Brieg, at 2,320,000*l.* Of this sum, France is expected to contribute from 1,750,000*l.* to 2,000,000*l.* The Simplon line possesses the advantage, compared with the St. Gotthard and Mont Cenis Railways, of a lower altitude (its level is from 1,312 ft. to 1,640 ft. lower), as well as very convenient junctions. The route from Milan to Paris, compared with the two other lines, will, by the Simplon line, be shortened by 95 miles and 79½ miles respectively. These are reasons enough to justify the conclusion that the construction of the Simplon Railway will follow close upon that of the St. Gotthard Railway. Germany, however, has a start of at least ten years, and there appears to be every probability that she will make good use of her opportunity.

THE GATE OF THE LIONS.

SIR,—I noticed in your leading article (p. 257, *ante*) a reference to the mouldings of the capital between the lions at Mycenæ. I send to you, herewith, a sketch of them made by me a few months since.



I was at Mycenæ many years ago, but did not take any sketches, as I believed that my dear friend, Professor Donaldson, had given them in connexion with the other drawings of the gate which were published by him.

But, very singularly, these mouldings were omitted; and although I have lately consulted, for a special purpose, all the drawings which I could find of Mycenæ, I could find no section whatever of the mouldings.

To draw them with absolute correctness could be managed only from a ladder. My drawing was made from the top of the stone nearest to the carved block, and was verified by a companion who climbed up on the stone with me. I ought to add that I was then quite unconscious of the resemblance of the capital to the Ionic base, and it was not until I happened to look at the sketch its reversed way that I saw the singular resemblance.

So far as I know, it is the earliest specimen in existence, and if, as I strongly suspect, it is actually a base reversed, it is the very earliest base, by very many centuries, known.

Next to it would come the bases shown in the Assyrian bas-reliefs.

In the little museum in which Dr. Schliemann (praise to him!) has preserved many remnants of the old work at Mycenæ, is a portion of a base to a semi-column (*vide* rough sketch), which I at once recognised as being of the same type as the one which Professor Donaldson has drawn at the entrance of the tomb, and which has long been lost.

Mr. Murray pointed out to me lately, at the British Museum, a small part of another of these bases.

A most interesting tomb of the same type as those at Mycenæ and Orchomenos has recently been discovered at Menidi, near Athens.

The Germans have published a plan and description; but, so far as I am aware, nothing beyond this has been made public.

It is very little known, and had it not been for the kindness of Mr. Murray I should have missed seeing it, as the local guides altogether ignore it.

Several details of it, such as the Egyptian method of attempting to relieve the lintel from the weight of the enormous mass above it, are peculiar and well worthy of attention; and, altogether, it would be difficult to find a more interesting vestige of the ancient races, existing, as it does, almost perfect within an easy walk of the Acropolis. T. HAYTER LEWIS.

TECHNICAL SOCIETIES IN HOLLAND.

ACCORDING to an article in one of our foreign contemporaries, there are only two technical societies of importance in Holland,—those for the development of engineering and architecture.

The "Koninklyk Institut van Ingenieurs" (Royal Institute of Engineers) was originally founded at Delft, but since 1860 has been domiciled at the Hague. A special branch has since 1851 been occupied with matters connected with the Dutch possessions in the East.

The Institute holds five regular meetings during the year, one of which is for the purpose of approving the annual report and electing officers. One of the meetings is usually held at some point other than the Hague, and is in connexion with the examination of some work of interest at the town selected. The society receives an annual grant from the State of about 70*l.*, and its property (including its library) was in the last report estimated at a value of about 1,000*l.* The membership of this society is regarded, it is said, as a mark of honour.

The career of the "Maatschappy tot Bevordering der Bouwkunst" (Society for the Development of Architecture) does not seem to have been in the past equally successful with that of the Institute previously referred to. Since its re-organisation last year it seems, however, to have taken a fresh start. Archæological researches come within its sphere of action. Its head-quarters are in Amsterdam, where it has its own premises. Meetings do not seem a strong point with this body, as only one general meeting annually and one excursion assembly are provided for by the statutes. Provision is, however, made for prize competitions of various kinds among the members.

THE INFLUENCE OF BAROMETRIC PRESSURE ON THE DISCHARGE OF WATER FROM SPRINGS.

THIS was the subject of a paper read before the British Association (Section C, Geology) by Mr. Baldwin Latham, M. Inst. C.E. He said that it was alleged, by some of the long-established millers on the chalk streams, that they were able to foretell the appearance of rainfall from a sensible increase in the volume of water flowing down the stream before the period of rainfall. He had, therefore, undertaken a series of observations to investigate the phenomena, and he found, in setting up gauges in the Bourne flow in the Caterham Valley, near Croydon, in the spring of this year (1881), and selecting periods when there was no rain to vitiate the results, that whenever there was a rapid fall in the barometer, there was a corresponding increase in the volume of water flowing, and with a rise of the barometer there was a diminution in the flow. The gaugings of deep wells also confirmed these observations; for where there was a large amount of water held by capillarity in the strata above the water-line at that period of the year when the wells became sensitive and the flow from the strata was sluggish, a fall in the barometer coincided with a rise in the water-line, and under conditions of high barometric pressure the water-line was lowered. Percolating gauges also gave similar evidence, for, after percolation had ceased and the filter was apparently dry, a rapid fall of the barometer occurring, a small quantity of water passed from the percolating gauges. The conclusion arrived at was that atmospheric pressure exercises a marked influence upon the escape of water from springs.

Professor J. Prestwich, who regarded the question as an exceedingly interesting and complicated one, took exception to some of the remarks of Mr. Latham as to the water zones. That gentleman, he said, had treated the subject in a very ingenious manner, but he (the speaker) did not feel they had sufficient evidence before them to determine the question, and he hoped that Mr. Latham would continue his inquiry, and that more importance would be attached to it.

Dr. J. Evans, F.R.S., who had given the subject much consideration, and had taken observations for some years, complimented the reader of the paper, who, he thought, had brought forward facts sufficient to establish his interesting theories. He gave an account of the results which had come under his own observation, and hoped that Mr. Latham would pursue his investigations, and endeavour to ascertain the amount of percolation in the chalk, and the quantity of water available from it for drinking and various other purposes.

Mr. Bateman, C.E., added his testimony to the remarks which had been made respecting the influence of barometric pressure, and spoke of the effects of rainfall upon the water-beds. He gave instances of the influences of the rainfall in different parts of England, and, in conclusion, said they were much indebted to Mr. Latham for his remarks, for they were the result of absolute observations, and might have an actual bearing in all cases where spring water is relied upon for the supply of towns. The observations were also of value as they were the record of facts which might be used in future for scientific purposes.

Mr. W. Topley stated that although they were indebted to Mr. Latham for his valuable paper, the subject was not a new one, it having been brought forward years ago by Mr. Bailey Denton, who had made interesting observations on the subject.

Professor Hughes asked the author of the paper whether he had taken into consideration the hygrometric conditions, as it appeared that he had observed that different flows coincided with the south-west and east winds. The difference in pressure on surface and subterranean waters due to evaporation of surface water under the dry east wind or moist south-west wind, would be so great that it should not be neglected in considering such small differences of actual pressure as are to be referred to the atmosphere.

Mr. J. Lucas, as a resident in the neighbourhood, Mr. Milne, and Mr. Scott, from the Meteorological Office, continued the discussion, the latter observing that Mr. Latham had distinctly proved his case in the paper he had read.

The Chairman (Professor Ramsey) said he had

listened to the paper with great interest. He had given the subject his careful consideration, and the result had been that he had been enabled to predict the state of the weather with tolerable accuracy.

Mr. Latham, in replying to what had been said, stated that, with regard to the remarks of Professor Hughes, he had considered the bearing of hygrometric influences. He had been led to make his observations a good deal as a sanitarian, on account of the knowledge that the town of Croydon was subject every few years to diseases, and which he believed arose from the water supply. There was no doubt that underground water had a wonderful bearing upon the public health of this country, and he hoped that in future more consideration would be given to the connexion of wells with health, for this would be found of great value in relation to the sanitary condition of the country.

ELECTRICITY AND POWER.

SIR WILLIAM ARMSTRONG, in his address to the British Association, as president of the section of Mechanical Science, inquired into the advantages that might be obtained over the steam-engine by resorting to electrical methods of obtaining power.

With regard to this important question, most people, he said, especially those who are least competent to judge, look to electricity as the coming panacea for all mechanical deficiency, and certainly the astonishing progress of electricity as applied to telegraphy and to those marvellous instruments of recent invention which the British Post-office claims to include in its monopoly of the electric telegraph, as well as the wonderful advance which electricity has made as an illuminating agent, does tend to impress us with faith in its future greatness in the realm of motive power as well. The difference between heat and electricity in their modes of mechanical action is very wide. Heat acts by expansion of volume, which we know to be a necessarily wasteful principle, while electricity operates by attraction and repulsion, and thus produces motion in a manner which is subject to no greater loss of effect than attends the motive action of gravity, as exemplified in the ponderable application of falling water in hydraulic machines. If, then, we could produce electricity with the same facility and economy as heat, the gain would be enormous; but this, as yet, at least, we cannot do. At present by far the cheapest method of generating electricity is by the dynamic process. Instead of beginning with electricity to produce power, we begin with power to produce electricity. As a secondary motor, an electric engine may, and assuredly will, play an important part in future applications of power; but our present inquiry relates to a primary and not a secondary employment of electricity. Thus we are brought to the question, From what source, other than mechanical action, can we hope to obtain a supply of electricity sufficiently cheap and abundant to enable it to take the place of heat as a motive energy? It is commonly said that we know so little of the nature of electricity that it is impossible to set bounds to the means of obtaining it; but ignorance is at least as liable to mislead in the direction of exaggerated expectation as in that of incredulity. It may be freely admitted that the nature of electricity is much less understood than that of heat; but we know that the two are very nearly allied. The doctrine that heat consists of internal motion of molecules may be accepted with almost absolute certainty of its truth. The old idea of heat being a separate entity is no longer held, except by those who prefer the fallacious evidence of their senses to the demonstrations of science. So, also, the idea of electricity having a separate existence from tangible matter must be discarded; and we are justified in concluding that it is merely a strained or tensional condition of the molecules of matter. Although electricity is more prone to pass into heat than heat into electricity, yet we know that they are mutually convertible. In short, I need scarcely remind you that, according to that magnificent generalisation of modern times, so pregnant with great consequences, and for which we are indebted to many illustrious investigators, we now know that heat, electricity, and mechanical action are all equivalent and transposable forms of energy, of which motion is the essence. To take a cursory view of our available sources of energy, we have firstly the direct heating power of the sun's rays, which as yet we have not succeeded in applying to motive purposes. Secondly, we have water-power, wind-power, and tidal-power, all depending upon influences lying outside of our planet. And, thirdly, we have chemical attraction or affinity. Beyond these there is nothing worth naming. Of the radiant heat of the sun I shall have to speak hereafter, and bearing in mind that we are in search of electricity as a cause and not an effect of motive-power, we may pass over the dynamical agencies comprised under the second head, and direct our attention to chemical affinity as the sole remaining source of energy available for our purpose. At present we derive motive-power from chemical attraction through the medium of heat only, and the question is, can we with advantage draw upon the same source through the medium of electricity? The process by which we obtain our supply of heat from the exercise of affinity is that of combustion, in which the substances used consist, on the one hand, of those we call fuel, of which coal is the most important, and on the other, of oxygen, which we derive from the atmosphere. The oxygen has an immense advantage over every other available substance in being omnipresent and costless. The only money value involved is that of the fuel, and in using coal we employ the cheapest oxidisable substance to be found in nature. Moreover, the weight of coal used in the combination is only about one-third the weight of oxygen, so that we only pay upon one-fourth of the whole material consumed. Thus, we have conditions of the most favourable description for the production of energy, in the form of heat, and if we could only use the affinities of the same substances with equal facility to evolve electric energy instead of heat energy there would be nothing more to desire; but as yet there is no appearance of our being able to do this. According to our present practice, we consume zinc, instead of coal, in the voltaic production of electricity, and not only is zinc thirty or forty times dearer than coal, but it requires to be used in about six-fold larger quantity in order to develop an equal amount of energy. Some people are bold enough to say that, with our present imperfect knowledge of electricity, we have no right to condemn all plentiful substances other than coal as impracticable substitutes for metallic zinc, but it is manifest that we cannot get energy from affinity where affinity has already been satisfied. The numerous bodies which constitute the mass of our globe, and which we call earths, are bodies in this inert condition. They have already, by the union of the two elements composing them, evolved the energy due to combination, and that energy has ages ago been dissipated in space in the form of heat, never again to be available to us. As well might we try to make fire with ashes as to use such bodies over again as sources of either heat or electricity. To make them fit for our purpose we should first have to annul their state of combination, and this would require the expenditure of more energy upon them than we could derive from their recombination. Water, being oxydised hydrogen, must be placed in the same category as the earths. In short, the only abundant substances in nature possessing strong unsatisfied affinities are those of organic origin, and in the absence of coal, which is the accumulated product of a past vegetation, our supply of such substances would be insignificant. This being the case, until a means be found of making the combination of coal with oxygen directly available for the development of electric energy, as it now is of heat energy, there seems to be no probability of our obtaining electricity from chemical action at such a cost as to supplant heat as a motive agent. Sir W. Armstrong then discussed the transmutation of heat economically into the more available form of electricity, and continued,—It is only the want of an efficient apparatus for converting heat into electricity that prevents our using the direct heating action of the sun's rays for motive power. In our climate, it is true, we shall never be able to depend upon sunshine for power, nor need we repine on that account so long as we have the preserved sunbeams which we possess in the condensed and portable form of coal, but in regions more favoured with sun and less provided with coal the case would be different. The actual power of the sun's rays is enormous, being computed to be equal to melting a crust of ice 103 ft. over the whole earth in a year. Within the tropics it would be a great deal more, but a large deduction would everywhere have to be made for absorption of heat by the atmosphere. Taking all things into account, however, we shall not be far from the truth in assuming the solar heat in that part of the world to be capable of melting annually, at the surface of the ground, a layer of ice 85 ft. thick. Now let us see what this means in mechanical effect. To melt 1 lb. of ice requires 142·4 English units of heat, which, multiplied by 772, gives us 109,932 foot-pounds as the mechanical equivalent of the heat consumed in melting a pound of ice. Hence we find that the solar heat operating upon an area of one acre in the tropics, and competent to melt a layer of ice 85 ft. thick in a year, would, if fully utilised, exert the amazing power of 4,000 horses acting for nearly nine hours every day. In dealing with the sun's energy we could afford to be wasteful. Waste of coal means waste of money and premature exhaustion of coal-beds. But the sun's heat is poured upon the earth in endless profusion,—endless, at all events, in a practical sense,—for whatever anxiety we may feel as to the duration of coal, we need have none as to the duration of the sun. We have, therefore, only to consider whether we can divert to our use so much of the sun's motive energy as will repay the cost of the necessary apparatus, and whenever such an apparatus is forthcoming we may expect to bring into subjection a very considerable proportion of the 4,000 invisible horses which Science tells us are to be found within every acre of tropical ground. But whatever may be the future of electricity as a prime mover, either in a dominant or subordinate relation to heat, it is certain to be largely used for mechanical purposes in a secondary capacity; that is to say, as the offspring instead of the parent of motive power. The most distinctive characteristic of electricity is that which we express by the word "current," and this gives it great value in cases where power is required in a transmissible form. The term may be objected to as implying a motion of translation analogous to the flow of a liquid through a pipe, whereas the passage of electricity through a conductor must be regarded as a wave-like action communicated from particle to particle. In the case of a fluid current through a pipe, the resistance to the flow increases as the square of the velocity, while in the case of an electric current the resistance through a given conductor is a constant proportion of the energy transmitted. So far, therefore, as resistance is concerned, electricity has a great advantage over water for the transmission of power. The cost of the conductor will, however, be a grave consideration where the length is great, because its section must be increased in proportion to the length to keep the resistance the same. It must also be large enough in section to prevent heating, which not only represents loss, but impairs conductivity. To work advantageously on the system a high electro-motive force must be used, and this will involve loss by imperfect insulation, increasing in amount with the length of the line. For these reasons there will be a limit to the distance to which electricity may be profitably conveyed; but within that limit there will be wide scope for its employment transmissively. Whenever the time arrives for utilising the power of great waterfalls, the transmission of power by electricity will become a system of vast importance. Even now, small streams of water, inconveniently situated for direct application, may, by the adoption of this principle, be brought into useful operation. For locomotive purposes, also, we find the dynamo-electric principle to be available, as instanced in the interesting example presented in Siemens's electric railway, which has already attained that degre of success which generally foreshadows an important future. It forms a combined fixed engine and locomotive system of traction, the fixed engine being the generator of the power and the electric engine representing the locomotive. Steam-power may both be transmitted and distributed by the intervention of electricity; but it will labour under great disadvantage when thus applied, until a thoroughly reflective electric accumulator be provided, capable of giving out electric energy with almost unlimited rapidity. How far the secondary battery of M. Faure will fulfil the necessary conditions remains to be seen, and it is to be hoped that the discussions which may be expected to take place at this meeting of the British Association will enable a just estimate of its capabilities to be formed. The introduction of the Faure battery is, at any rate, a very important step in electrical progress.

It will enable motors of small power, whatever their nature may be, to accomplish by uninterrupted action the effect of much larger machines acting for short periods, and by this means the value of very small streams of water will be greatly enhanced. This will be especially the case where the power of the stream is required for electric lighting, which, in summer, when the springs are low, will only be required during the brief hours of darkness; while, in winter, the longer nights will be met by a more abundant supply of water. Even the fitful power of wind, now so little used, will probably acquire new life when aided by a system which will not only collect but equalise the variable and uncertain power exerted by the air. It would greatly add to the utility of the Faure battery if its weight and size could be considerably reduced, for in that case it might be applicable to many purposes of locomotion. We may easily conceive its becoming available in a lighter form for all sorts of carriages on common roads, thereby saving to a vast extent the labour of horses. Even the nobler animal that strides a bicycle, or the one of fainter courage that prefers the safer seat of a tricycle, may ere long be spared the labour of propulsion, and the time may not be distant when an electric horse, far more amenable to discipline than the living one, may be added to the bounteous gifts which science has bestowed on civilised man.

THE SERPENT MOUNDS OF THE SCOTTISH BORDER.

THIS subject was treated of by Dr. Phené in a paper at the recent meeting of the British Association in York. After adverting to the persistent retention of curious customs, and the handing down from generation to generation the traditionary lore of ages long past, the author of the paper referred to some of those which were corroborated by ancient monuments of an unusual kind still famous on the Scottish border. These consisted of sculptured stones, earthworks, and actual ceremonies.

Quoting from former writers, from family pedigrees, and other documents, it was shown that the estates to which such strange matters as follow pertained had been held alternately by those claiming under the respective nationalities, or more local powers, and which, from their natural defensive features, must have been places of Border importance earlier than history records. The district is occupied by the descendants,—often still traceable,—of Danes, Jutes, Frisians, Picts, Scots, Angles, and Normans; and by a comparison of several of the languages of these people, as well ancient as now existing, and also of the Gothic, it was shown in relation to a particular class of the most curious monuments, that the Norse "ormr," Anglo-Saxon "vyrm," old German "wurm," Gothic "vaúrms," pronounced like our word worm; and the word "lint" or "lind," also German, and the Norse "linni," are all equivalent, and mean "serpent"; and in some cases the two words are united, as in modern German "lindwurm," and the Danish and Swedish "lindorm." On this, apparently, rested the names of some of the places having these strange traditions, as Linton or serpent-town, Wormiston or worm's (ormr's) town, Lindisfarne, the Farne serpent island, now Holy Island, &c., and also the various worm hills, or serpent mounds of those localities. It was curious that the contest (like that of St. George) was sometimes with two dragons, as shown on a sculptured stone in Linton Church, and on a similar stone at Lyngby in Denmark, in the churchyard, where there was a tradition that two dragons had their haunt near the church. From these and other facts, the author concluded that the contests were international, and in the case of two dragons, an allied foe, either national, religious, or both, was overcome. He showed from the Scottish seals that Scotland used the dragon as an emblem, apparently deriving it from the Picts; that the Scandinavians also used it; and that these nationalities were antagonistic to the Saxon. In the time of David I. of Scotland, the first great centralisation of Saxon power took place, and the powerful family of the Cumyns took, apparently by conquest, at least two of the localities having these strange traditions. And as the political object was to suppress the Celtic and Scandinavian, or other local national feeling, there could be little doubt that, however they obtained them, the persons dispossessed were of one or other of the Northern tribes. Hence, probably, the Middle-age tradition of the slaying of the serpent or dragon, or the serpent or dragon bearer, on the Anglo-Scottish border. But he considered such traditions would hardly have originated through such conquests had not previous marvellous stories existed of the prowess and conquest by the dragon (bearers) of the lands they invaded, all the wonders of which would be transferred to the conqueror's conqueror. Hence these stories were not to be set aside with a sneer, as in them was a germ of history, giving us, perhaps, the only insight we could obtain of the prehistoric customs and mythology of some of the ancient tribes of Britain. Earthen mounds, tumuli, standing stones, &c., still existed in some of these localities, with all of which the dragon serpent or worm was associated in the legends.

The author then described his personal experiences in the still-existing dragon ceremonies in the south of France and Spain, which were always either on the present national or former less important provincial frontiers, and which still formed the subjects of great ecclesiastical ceremonies. These have been already referred to in our pages.

One of the high ecclesiastical dignitaries of the north of England—the Bishop of Durham—is in the position of having to take part in such a ceremony. Whenever a bishop of that diocese enters the manor of Sockburn for the first time, the Lord of the Manor, who holds under the see of Durham, subject to the following tenure, has to present the bishop, "*in the middle of the River Tees*, if the river is fordable, with the falchion wherewith the champion Conyers destroyed the *worm*, *dragon*, or *fiery flying serpent*, which destroyed man, woman, and child" in that district, and an ancient altar called "*Greystone*," still marks where the dragon was buried.

The subject was illustrated with views of all the places referred to on the Anglo-Scottish, French, and Spanish border counties.

ANCIENT DWELLINGS ON THE YORKSHIRE WOLDS.

To the Anthropological Department of the British Association meeting in York, Mr. J. R. Mortimer contributed an account of the discovery of six ancient dwellings found under and near the British barrows on the Yorkshire Wolds. Dwelling No. 1 was situated at the eastern end of the barrow, which was one of the long type. Its depth from the base of the mound was 6 ft. 6 in., with a floor surface of 9 ft. 6 in. by 7 ft. 6 in., and it was entered by two winding passages 24 ft. in length, the northern one being cut by the side trench of the barrow, showing in this case that the construction of the dwelling had preceded the excavation of the trench, and was therefore older than the barrow. In the material filling the dwelling and its passages were many streaks of burnt wood, a human femur, portions of an urn, and many animal bones, all probably the residue of feasting. A little distance from the dwelling were portions of three more dish-shaped urns, and traces of interments. Dwelling No. 2 contained similar remains, and in Nos. 3 and 4 were found bones of the red deer and the urus. No. 5 consisted of an inner and outer circle of upright posts. In the centre was an oval grave cut 4 ft. into the rock, and containing the flexed human remains of a large male. In front of his face lay a crushed food vase, and close to his left shoulder was a perforated axe hammer. Clayey matter covered the grave and extended to the outer circle of the post-holes. This was believed to be the residue of the sides of the dwelling, in the centre of which its owner was interred, and afterwards the walls were pushed down over the grave and covered with a mound. Mr. Mortimer suggested that the space between the two circles of uprights might have been used for storing heads of grain and other provisions for winter use at a time when man's dwelling was the only building he possessed for all purposes. No. 6 resembles No. 5. Small branches of oak, ash, maple, and other trees, thought to be the remains of the wattled sides of the hut, had left their impressions in the circular bed of clayey matter, some of which showed cuts made with the axe and the saw, seemingly of metal. The droppings from the eaves of this hut had stained the ground all round with colouring from the thatch of the roof, which probably was the straw of wheat, for Mr. Mortimer possessed carbonised grains of this cereal from the primary interment of an undoubted British barrow near. Until the previous dwelling, the occupier had not been interred within the walls of this circle, but just a few feet outside, towards the rising sun. It was accompanied by a delicately-formed flint-knife, lying close to the right arm, and a finely-ornamented food-vase near the head. As in the previous case, the dwelling had been crushed down at the time of interment, and carefully covered with the barrow, showing but a step between the habitation of the living and the house of the dead.

A VIKING'S SHIP.

IN the Department of Anthropology, York meeting of the British Association, Mr. J. Harris Stone read a paper on the Viking ship discovered at Sandefjord, Norway, in 1880. Instead of an antiquated, rudely-constructed, and roughly-finished vessel, with primitively-drawn lines, it was a smart, trim-looking craft, built on what a sailor would call beautiful lines, and was admirably adapted as well for speed as for general seaworthiness. It was difficult to conceive of such a fresh-looking and well-preserved ship being, as it was undoubtedly, about a thousand years old. He feared that the discovery of this ancient galley had not given them any argument in favour of the theory of the growing superiority of mankind in all branches of knowledge and industry. There were no means of knowing whether this ship was or was not concerned in the raid of the Vikings and their followers on our coasts. They plagued Scotland with varying success until 1014, when a treaty was made between Malcom and King Swene, of Denmark, the result of the plucky and steady resistance of the Scotch. The name of the Viking owner of this ship was not known. All that could be said was that he lived at some time during the period from the end of the eighth to the middle of the eleventh century, and that when he died he was buried in his vessel, which was drawn up on land, and had a mound of earth thrown over it, which, luckily for posterity, consisted of blue clay. The vessel which Frithiof beautifully apostrophised, and which entered so largely into the Saga associated with his name, was doubtless a galley similar in all respects to this one. The vessel was now at Christiania. It was excavated at Gdestad, Sandefjord, about half a mile from the present seashore. In this ship the sepulchral chamber in which the Viking's body had been deposited was situated amidships. It was tent-like in shape, made of logs placed side by side, leaning and meeting on a ridge, the side running parallel with the main axis of the ship. The mound appeared to have been entered, no doubt for the purpose of plunder, for none of the Viking's weapons were found, and only a few of his bones were discovered. There were found in the sepulchral chamber the bones and feathers of a peacock, the bones of a little dog, some fish-hooks, and several mountings to belts and harness. Round about the ship were discovered the bones of some nine or ten horses and dogs, which had been sacrificed at the time of burial. The vessel was 77 ft. 11 in. in length between the rabbets at the gunwale, and at the widest part 16 ft. or 17 ft. across. From the top of the keel to the gunwale amidships she was 5 ft. 9 in. deep. She would draw probably not 4 ft. of water, and she had twenty ribs. She was clinker-built, and her planks slightly overlapped, like slates on the roof of a house. Her lines were calculated for swiftness as well as for seaworthiness. The planks and timber of the frame were fastened together with withes of tree-roots. The bent timbers seemed to be naturally grown, and not artificially bent. The boards of the sides were of good, sound, well-seasoned, and selected oak, about 1¼ in. in thickness. They were smoothly planed, and firmly riveted together by iron rivets, which had been carefully clinched on either side. There were also a few oaken bolts near the upper part of the sides. He could find no trace of a saw having been used anywhere about the vessel. The planks had their edges moulded. The mouldings consisted of indented lines running down the length of the planks near the lower margins. Bow and stern were of similar shape. They were painted, and must have risen a considerable distance out of the water. The top of each was broken, so that it could not

now be determined whether she originally carried a figure-head or not. The keel was deep, and made of thick oak beams. He could not see whether any metal keel had been fastened to the bottom. In the Frithiof Saga, however, "the ball of copper" was spoken of, and he presumed that there might have been something similar in this vessel. An iron anchor found with the vessel had so rusted away that it could not be preserved. There was no deck to the galley, and the absence of seats for the rowers was notable. The flooring could be lifted to allow of baling out water. The oars were 20 ft. long, and the oar holes, sixteen on each side, had slits towards the stern of the vessel to allow the blade to pass through from the inside. The most interesting thing about the ship was the rudder, which was on the starboard side, a foot or two from the stern. Starboard was a corruption of the word "sturboard," which no doubt owed its origin to the ancient position of the rudder, as in this galley. This rudder resembled a large oar, consisting chiefly of blade and a short handle. It was fixed not to the side of the boat directly, but to the distal end of a piece of conical wood, which projected about a foot from the vessel. This piece of wood was bored down its length, and no doubt a rope passing through it secured the rudder to the ship's side. The steering was effected by a tiller fixed in a hole at the upper end of the handle portion, and probably also by a rope fastened at the lower end of the blade. It was hoped that the correct shape of this galley, which was photographed, would rapidly circulate among artists, and for ever put an end to the curious drawings and paintings of the Viking galleys. The vessel had one mast. In the mound were also found parts of three small oaken boats, generally like a galley itself, a large well-made sheet copper caldron, a few bedsteads like those used in Norway in the present day, some drinking-cups and tubs, and some pieces of carved and painted wood, the use of which is uncertain. Several large round shields of thin wood were also found. These could not have been for defence, but must have been for ornament. A landing-stage made of oak was also found in the mound. The surface of this plank is carved ornamentally, to prevent slipping, and many on seeing the photographs and diagrams would turn their thoughts to the Bayeux tapestry in Normandy, in which were numerous representations of galleys similar to the one now described. The discovery of this galley throws a flood of quite unexpected light upon a period of history which is, perhaps, as dark and obscure as any during historic times.

CHEAP GAS FOR GAS-MOTORS.

MR. J. EMERSON DOWSON, C.E., read a paper on the economical effect of using cheap gas for gas-motors, &c., before the Mechanical Science section of the British Association. In it he described an apparatus invented by him for producing cheap gas, and gave some notes on the economical effect of using such gas with gas-motors, &c. Having reviewed what had already been done to produce a cheap heating gas, the writer stated that he had devised an apparatus which was small in size and easy to work. The apparatus was described in detail. The quantity of water required was very small, being only about seven pints for each 1,000 cubic feet of gas, and except on the first occasion when the apparatus was started, the coil was heated by some of the gas drawn from the holder. For boiler and furnace work the gas could be used direct from the generator; but where uniformity of pressure was essential,—as for gas-engines, gas-burners, &c.,—the gas should pass into a holder. The nature of the fuel required depended upon the purpose for which the gas was used. The cost of making the gas depended to a great extent on the size of the generator; but for three sizes made, the total cost of production for 1,000 cubic feet was 4½d., 3½d., and 2¾d., respectively, after allowing 1s. to 1s. 6d. per day for wages. Experiments with the Dowson gas with the Otto gas-engine had proved that one-horse power (indicated) per hour was obtained with a consumption of gas derived from 1·46 lb. of coal, after allowing 10 per cent. for impurities and waste of the latter. Thus, by using the writer's gas a small gas-engine could compete favourably in fuel consumption with the largest and best steam-engines, and a very important saving could be effected when compared with steam-engines of moderate size and of the usual type. The paper concluded with a few words as to other purposes for which the author's gas could be used, and as to its calorific power for heating generally.

Sir F. Bramwell said he was glad to see any method put forward for using the energy in coal. The Otto gas-engine was exceedingly useful, and could be worked with economy. Unless some great improvement could be made in the steam-engine, that was the way in which they would in the future use their fuel. Again, they would not have boiler-explosions. Gas explosions were comparatively rare; but boiler explosions occurred from time to time, and caused about eighty deaths per annum.

SUBSIDENCES IN LAND.

IN the Geological Section of the British Association, a paper on "The Subsidences above the Permian Limestone between Hartlepool and Ripon," by A. G. Cameron, of the Geological Survey of England and Wales, was read by Mr. Topley. In this paper attention was drawn to the numerous forms of shrinkages of the land-surface, often extending to considerable depths into the rocks beneath, observable over the top of the Permian rocks betwixt Hartlepool and Ripon. As a general explanation of their origin, it was suggested that where the underground water, flowing over the limestone surface, reached the margin of the sandstone, it received a check, whereby it accumulated, forming a chain of dams or pools along the line of junction of these rocks. As denudation proceeds, hollows form above, until ultimately the phenomena of the pits appear. This being so, "the water bubbling and frothing all over" was explained without calling in the aid of river-action. Allusion was made to the Home Farm Colliery accident at Hamilton, N.B., in February, 1877, through a subsidence in the gravelly alluvium of the Clyde; also to the recent subsidences at Blackheath, near London; and to the extensive caverns in the hematite districts of Furness.

Mr. W. Whitaker referred to the subsidence at the Blackheath Pit, to which allusion was made in the paper, and expressed his opinion that it was due to artificial rather than natural causes.

Professor E. Hull, F.R.S., stated that great anxiety prevailed in the neighbourhood of Ripon in consequence of the subsidences which had taken place, and he said he should like to know from Mr. Cameron or any one else whether there was a possibility of a large hole being formed under the beautiful cathedral at Ripon, to the destruction of the towers or some part of that edifice.

The Rev. W. H. Oxley, of Grewelthorpe Vicarage, who had witnessed one of these subsidences, which he explained was from 80 ft. to 100 ft. deep, and 200 ft. in diameter, said that he did not think there was any fear, humanly speaking, of any danger occurring to Ripon Cathedral from the cause alluded to.

THE DEVELOPMENT OF THE COLOUR SENSE.

IN Section D, Biology, of the British Association meeting, Dr. Montagu Lubbock read a paper on "The Development of the Colour Sense," in the course of which he said that authors had generally considered the point at issue to be this,—"Is there sufficient evidence to show that the power of perceiving colour has been acquired by man within historical times?" He would extend the question further, and ask, "Is there evidence to show that the power of perceiving colour has been gradually acquired at any time, not only by man in historic or prehistoric times, but by the animal kingdom at large?" He proceeded to treat the question by dividing it into four parts, considering first of all in what the "colour sense" or "perception of colour" consists. He then briefly recalled what had been written on the subject, and the arguments which had been brought forward to prove that the power of appreciating colours had been gradually developed. Having commented on these arguments and considered their value as to the point at issue, he stated the conclusion which must be arrived at on the question. He said reasons more or less conclusive had been given for believing that, as far as man was concerned, no such gradual development could be shown to have taken place. To what conclusion must we come as to such development occurring in the animals of past ages? They had seen that the power of appreciating colour would become more and more perfect in those animals which lived upon coloured food; the same statement, however, might be made with respect to the power of distinguishing form, and there was no evidence to show that the improvement took place in one direction earlier than in the other. Neither did any proof exist that colour perception has been handed down with gradually increasing perfection from one species to another of the animal kingdom. If everything had reached its present form, its present condition, by evolution, colour perception must have done the same, but as yet there was no evidence to show how and through what stages this evolution took place.

Professor Foster having expressed his concurrence with the views of Dr. Lubbock,

Sir John Lubbock, in his comments on the paper, expressed the opinion that the conclusion to which Dr. Lubbock had come was fully warranted by the facts.

A LITERARY BRICKLAYER OF THE SEVENTEENTH CENTURY.

A FEW years ago we gave in the *Builder* some brief notes of a book on building matters, written by one Venterus Mandey. We were unable at the time to furnish any particulars of the author, who was a builder's workman, or bricklayer, as were his father and grandfather before him. We find that Mandey was buried in Ivor Church, Bucks, and his epitaph is given in Le Neve's "Monumenta Anglicana," 1719, which furnishes a brief epitome of his life, and shows that he died in 1701. The epitaph is worthy of reproduction in its entirety, and runs thus:—

"Beneath this place lyes interred the Body of VENTERUS MANDEY, of the Parish of St. Giles in the Fields, in the County of Middlesex, Bricklayer, Son of Michael Mandey, Bricklayer, and Grandson to Venterus Mandey, of this Parish, Bricklayer, who had y^e honour of being Bricklayer to the Hon^ble. Society of Lincoln's Inn, from the year of our Lord 1667 to the day of his death. He was Studious in Mathematics, and wrote and Published three Books for Public good, one Entituled 'Mellificium Mensionis; or, the Marrow of Measuring;' another of 'Mechanic Powers; or, the Mystery of Nature and Art unvayled;' a third, 'An Universal Mathematical Synopsis.' He also translated into English, 'Directorium Generale Uranometricum,' and 'Trignometra Plana et Sphærica, Linearis et Logarithmica,' 'Auctore Fr. Bonaventura Cavalerio Mediolanensi,' and some other Tracts which he designed to have Printed if Death had not prevented him. He dyed the 26th day of July, Anno Domini 1701, Aged 56 years and upwards. He also gave Five Pounds to the Poor of this Parish."

Mandey's "Mellificium Mensionis; or, the Marrow of Measuring," appears to have been first published in the reign of Charles II. In it "a new and ready way is shown how to measure glazing, painting, plastering, masonry, joyners', carpenters', and bricklayers' works," &c. A third edition, with additions (which appears to be a reproduced third edition), issued several years after the author's death, is before us. There is a frontispiece characteristic of the period, representing the author with flowing locks, and a necktie expanding into a tuft of folds upon his breast, with this inscription underneath, "Vera Effigies Ventera Mandey, Etatis Suæ 37 Anno 1682." The volume before us includes "A Garden of Geometrical Roses," &c., and "Some Principles and Problems in Geometry," &c., both originally written in Latin by Thomas Hobbes, but "done into English by Ven. Mandey." The Appendix contains a tract by the author on the "Measuring of Chimneys Reformed." Mandey mentions elsewhere in his book, when treating of glaziers' work, that for those who desired to measure in the decimal way, "I refer them to a Treatise put forth by my friend, Tho. Hammond, *A New and Exact Way of Mensuration*, which I writ for him when I was Apprentice." It will be seen from this that our "seventeenth-century bricklayer" imbibed a literary taste early in life.

To illustrate the method of measuring bricklayers' work in his time, and to assist young practitioners in making an estimate from a given design, Mandey furnishes a ground-plan of a building (no cellars or other rooms being beneath). This seventeenth-century plan is not unworthy of passing notice. There is a frontage of 25 ft. and a depth of 40 ft. The front and rear walls are 2½ bricks thick, and the two rooms, one front and one back, are each lighted by two windows, 4 ft. wide and 6 ft. 6 in. high. The flank walls are 2 bricks thick, and the story 11 ft. 6 in. to the top of the next floor. The door cases in front and rear are 4 ft. wide, and 9 ft. in height. The chimneys stand back to back, and flanking their sides; the stairs

start at right angles to, and nearly midway in, the passage that runs directly from the front to the back door. The enclosure of the stairs, as well as the partitions of the front and back rooms next the passage, are of timber, or intended as such, the style of the period being framed wainscoting and panelled work. Mandey shows young bricklayers how to set out brick arches, circular and elliptical, and to get out their "sommering moulds," and there is no question, considering him in the light of his time, he was a clever, clear-headed, and practical workman. The following, among others, will illustrate the orthography of some building terms in the seventeenth century, as we find them in Mandey's book:—"Plat" for plan, "reer" for rear, "jaums" or "jaumbs" for jambs, "sommering" for sammering, "plaistering" for plastering, "facio" for fascia, "lintol" for lintel, "tarsel" for tassel, "hipt" for hipped, "molding" for moulding, "quines" for quoins, "eves" for eaves, "hanse" for haunch, "center" for centre, &c. Some of the seventeenth-century terms are the proper ones, but the orthography of ordinary words, as well as technical ones, has undergone strange changes in a century, not to speak of those indicated above as belonging to an earlier period. Notwithstanding the advance of technical education, there are not many bricklayers at the present time in the British Islands (leaving literary acquirements aside) who understand their craft as well as it was understood and practised by Venterus Mandey.

BUILDING NOTES FROM THE WEST OF ENGLAND.

THE general depression in trade has been, in the past year or two, severely felt by the building trade in the West of England, and business, though perhaps not so bad as it was a short time ago, is not what those engaged in it could wish it to be. House-building, especially of the speculative character, is, compared with what it was five or six years since, at a standstill, and such a large number of houses in all districts are void, that there does not seem a prospect of a speedy revival in this department. In some of the large and poor parishes of Bristol nearly 10 per cent. of the houses are uninhabited; but, rather singularly, though rents have been reduced, owners, unless suffering from special pecuniary pressure, do not seem willing to lower their selling prices. Amongst the more important works in Bristol and the West, which are now in hand or have just been completed, may be mentioned the following:—

The addition of a wing to the Bristol General Post-office is the principal feature in a series of new arrangements which are being carried out for the more convenient transaction of the business in the various departments. The old accommodation has long been found insufficient, and in the alteration not only has the present need been considered, but provision has been made for the parcel-post system, which is to come into operation in a couple of months. The wing has been erected by Messrs. Stephens & Bastow. The ground-floor is used for money-order, savings-bank, life assurance, and annuity business; and the upper portion, which is connected with the main building, is made into a letter-carriers' room. The new building is neat and appropriate in design, and its erection will greatly facilitate the growing work of the office.

Extensive baths and washhouses are to be erected at Jacob's Wells by the Corporation of Bristol. The designs have been prepared by Mr. Josiah Thomas, the city surveyor, and arrangements have been made in them for forty-eight baths,—viz, thirty-six for males and twelve for females,—and for fifty-two washing compartments. All conveniences in the way of machinery for washing, drying, ironing, &c., have been provided. The swimming-bath will be 80 ft. by 49 ft. The total cost has been estimated at 20,000*l*. Application for tenders having been made to twenty-eight of the leading contractors in London and the West of England, that of Mr. A. Krauss, of Bristol, for 15,107*l*., has been accepted. For the mechanical engineer's work tenders have also been received, and that of Messrs. W. J. Fraser & Co., for 3,535*l*. is accepted. In addition to these contract prices 1,117*l*. has been expended in building the retaining wall. The site cost nearly 4,000*l*., so that the work altogether will be an expensive one.

The Bristol Town Council has been ordered by an arbitrator, to whom the matter was referred, to pay 9,639*l*. to the London and South-Western Bank for a piece of ground given up by them (the Bank) in Corn-street and Small-street. The site of the new bank was obtained by pulling down St. Werburgh's Church, afterwards erected in a growing suburb, the tower of which projected on the pavement of Corn and Small streets. The Banking Company, having bought the site, claimed 13,000*l*. for the bit of ground they were compelled to give up. The new bank, a handsome structure as originally designed, is marred by being unfinished on the Small-street side, the stoppage of work being in consequence of a complaint that the lighting of the adjoining commercial rooms would be interfered with if the plans were carried out in their entirety.

The Bristol School Board has just decided upon building another Board school, and have authorised the purchase of half an acre of land for 1,000*l*. near Newfoundland-road, one of the poorer districts of Bristol. The school will accommodate 300 boys, 300 girls, and 200 infants.

An effort having been made to raise the south-west tower of Bristol Cathedral to the same level as the north-western, so as to give due effect to the new western porch, subscriptions were forwarded to the dean, and the work has now been commenced by the contractors, Messrs. Booth.

Messrs. Jones & Co. and Messrs. Baker & Co., two of the large Bristol drapery and fancy goods firms, have materially improved the appearance of Wine-street by additions to their premises. The former's new building is by far the more imposing of the two, and its external architectural arrangements are agreeable. Messrs. Fripp & Saunders supplied the designs.

As a kind of set off against the recent electric lighting experiments, which by the way resulted in nothing as far as permanent use is concerned, the Bristol Gas Company are trying at their own cost Sugg's burners over a mile and a half of roadway leading from the railway station to the Victoria Rooms. Kitt's drum-like reflecting arrangement has been used for some time on part of this route, but pedestrians and drivers pronounce it unsatisfactory.

The Parish Church of Mathern, a village near Chepstow, is being restored. Mathern is remarkable as the burial-place of Theodrick or Teudrick, the hermit king of Glamorgan, who, it is stated, having resigned his kingdom to his son Maurice, led an eremetical life amongst the rocks of Dydyrn. He was, however, dragged from his hermitage to command an army against the invading Saxons, under Ceolwulph, king of Wessex, in the year 600, in the belief that, having always conquered his enemies, he would again. He was victorious, but was slain in the conflict in the Vale of Tintern. A plain mural tablet in the chancel of the present church gives particulars of his death. The estimated cost of the restoration of this interesting church is 2,500*l*.

The Gloucester tramways have been transferred to a new company, the promoters of which are the same as those interested in the Bristol and Bath systems. Important alterations and additions have been made, the expenditure being about 16,000*l*.; the sum, however, represents an actual expenditure during the last two years of 32,000*l*. Mr. A. Krauss, of Bristol, was the contractor for the alterations.

A new Board school has been opened at Newport by the School Board of that town.

Steps are being taken to provide a winter garden for Weston-super-Mare. The estimated cost is 5,000*l*.

A new chapel is in course of erection in the Claremont District, Bath, for the Primitive Methodist denomination, the memorial stone having been laid by Lady Hayter. The dimensions will be 39 ft. by 43 ft., with five classrooms beneath. At the rear will be a schoolroom, 18 ft. by 36 ft. Accommodation will be afforded in the chapel for 250 worshippers. The design is simple, and Mr. Bladwell has been given the contract for 1,100*l*.

The work of building a new church, to be dedicated to St. John the Evangelist, has been commenced at Charfield, the old church, having a history of 600 years, proving inconvenient and insufficient for the changing condition of the neighbourhood. The new building will be in the Early English style, and will be of local stone with freestone dressings. The roof is to be covered with Broseley tiles, and the bell-turret, in the absence of a tower, will be roofed with oak shingle. The length of the building will be 78 ft. in the clear, and the width 29 ft. There will be a vestry on the south-east side, and an organ-chamber on the south side. The porch will be at the north end. The floors will be wood, the aisles of plain tiles, and the pews of oak. The roof woodwork will be pitch pine, and the pulpit will be of oak on a stone base. It is intended to use the old churchyard as a cemetery and the church as a mortuary chapel. The new building is planned to seat 260 persons, and the cost is expected to be 2,500*l*. Mr. William W. Bethell, of Westminster, is the architect, and Messrs. Cox & Gyde, of Stroud, are the builders.

A new church,—St. Andrew's,—has just been completed at Rowbarton, near Taunton. It consists of nave with clearstory, north and south aisles, chancel, vestry, south porch, and tower. The latter is placed at the east end of the south aisle, and the lower stage of it is open to the church. The style of architecture is that of the Early Decorated period. The walls are of West Leigh stone in random courses, lined internally with brickwork, and the dressings are of Doulting stone. The whole of the interior is of brick. The piers supporting the arcades are made of bricks specially manufactured at Chudleigh-road; the other bricks are of Bridgewater manufacture, red and yellow ones and black tiles being arranged in patterns. The roofs are open timbered, plastered between the rafters, and covered with plain tiles of two colours. The plastering is relieved by stencilled ornamentation applied when the mortar was wet. The seating will be of pitch pine, and will be for nearly 500 persons. The chancel and passages are paved with Minton's tiles; the reredos is also of tiles manufactured by Messrs. Craven, Dunnill, & Co. The chancel windows and those of the clearstory have painted glass, by Hardman. The pulpit and font are of Beer stone. No carving or ornamentation has been introduced into the building, but it is ecclesiastical in character. The tower is surmounted by a timber-framed spire, with pale green Westmoreland slates, and rises to a height of 100 ft.; it is capped with a gilded weathercock. The cost of building is about 3,000*l*. Mr. J. H. Spencer, of Taunton, was the architect, and Mr. H. J. Spiller the contractor.

FROM ABROAD.

THE harbour works at Stade, which were commenced eighteen months ago, are now approaching completion, and include a quay wall 700 ft. in length. Two cranes, each able to lift two tons and a half, have been erected, and a third, of three times this strength, is being put up. In order to make the harbour of a suitable depth for the tonnage it is meant to accommodate, a steam dredger has for some time been in operation.

The correspondent at Sofia of the *Kölnische Zeitung* calls attention to the position which German architects have recently acquired in that city, and to the steadily increasing demand for glass, cast-iron work, marble work, wire, &c., of German manufacture, in place of the Austrian and English goods which used to have almost a complete control of the market. The new building for the Russian consulate has been built, he says, by a German contractor under a German architect, and from German materials to a large extent.

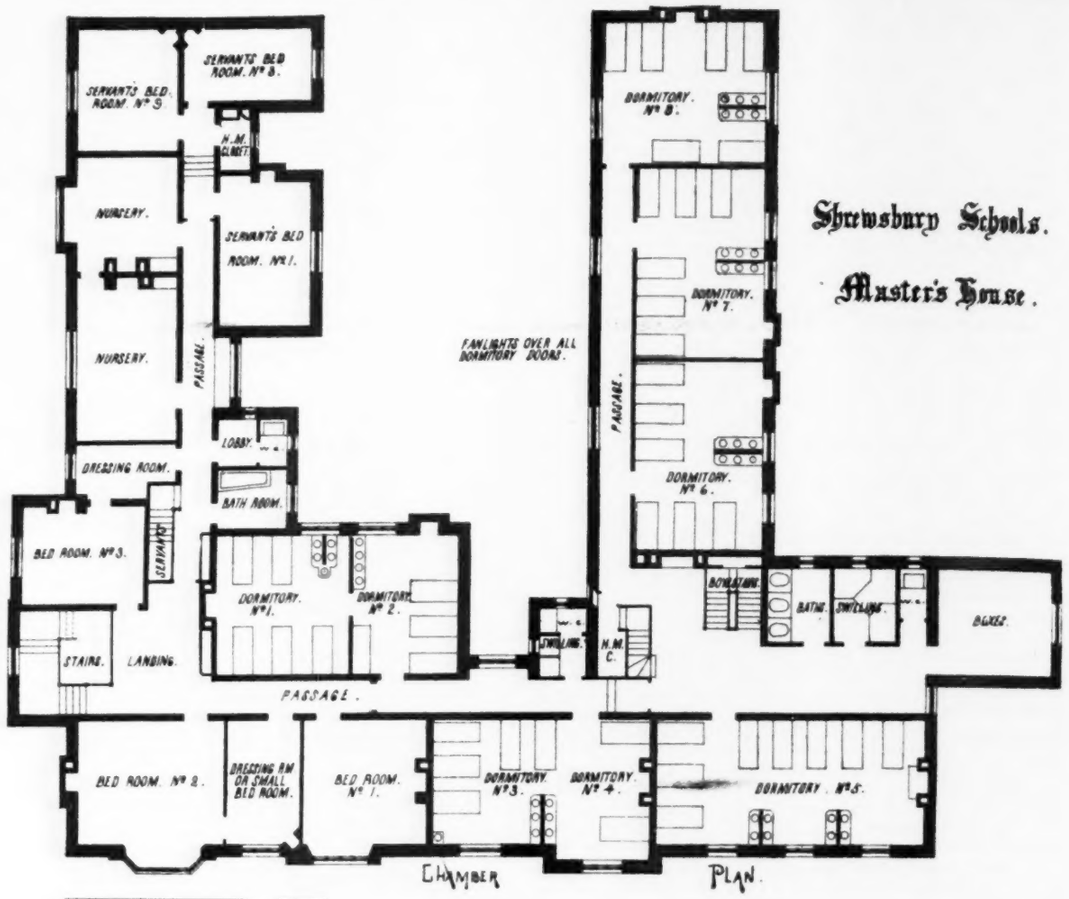
The German press has been calling attention to the compressed paper for railway carriage wheels, made by Messrs. Adt, of Farbach, which, as to the various qualities requisite for the purpose, is supposed to be superior to wood. On account of its non-conducting properties, it is said to be of special value for electric railways, and for tram-car wheels its suitability is said to be great.

The garrison church at Metz (lately completed) has been in course of erection since the 18th of August, 1875, when the foundation-stone was laid. The total cost has been about 1,250,000 marks, or over 60,000*l*. The German papers speak highly of the work.

A Sanitary Protection Association for Portsmouth, which is intended to undertake the supervision of the drainage arrangements of private houses, so as to ensure their proper sanitary condition, was started at a meeting held on the 5th inst., under the chairmanship of the ex-mayor, Mr. Alderman Cudlipp.

Shrewsbury Schools.

Master's House.



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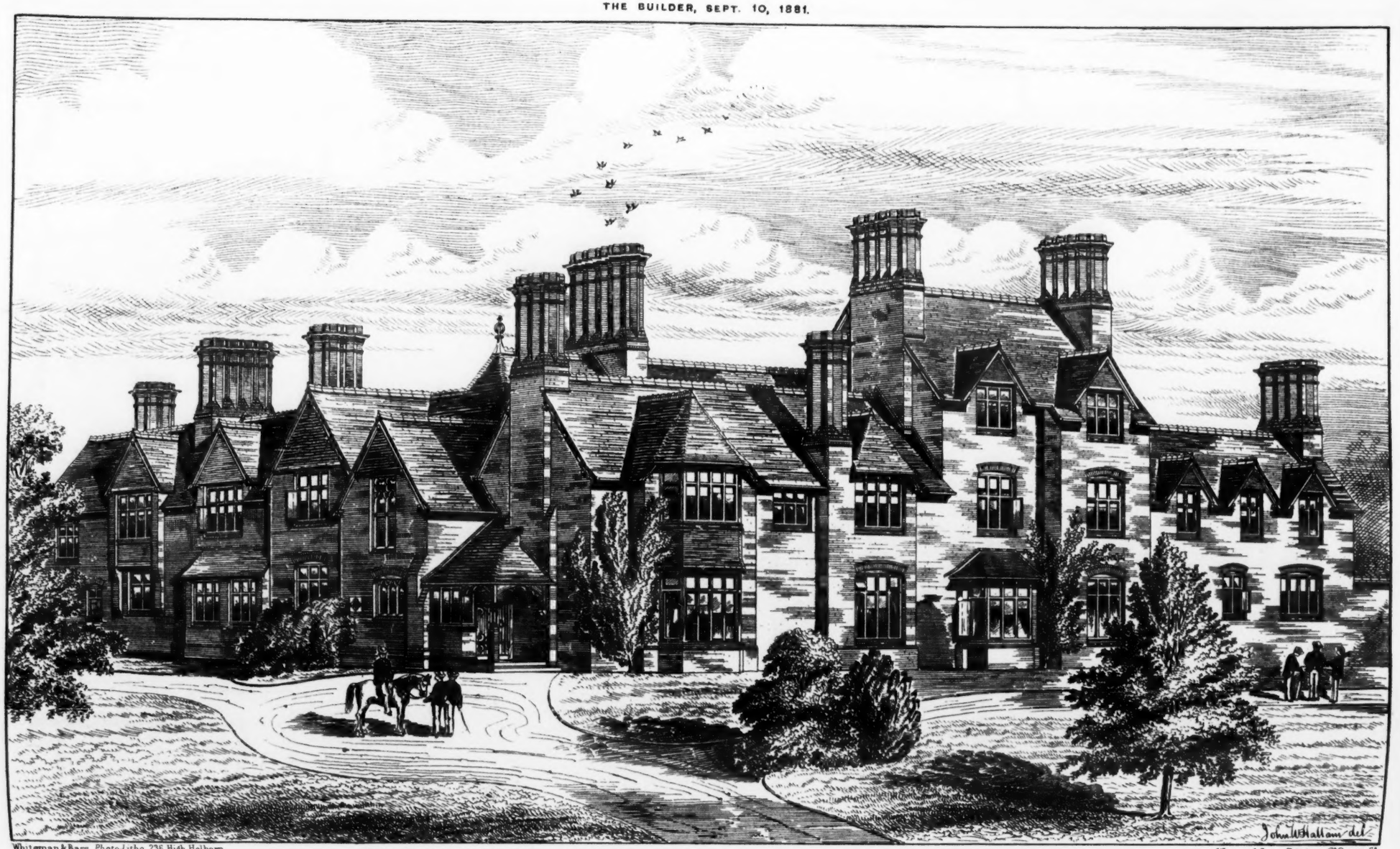

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SHREWSBURY SCHOOLS: MASTER'S HOUSE.—MR. WILLIAM WHITE, F.S.A., ARCHITECT.

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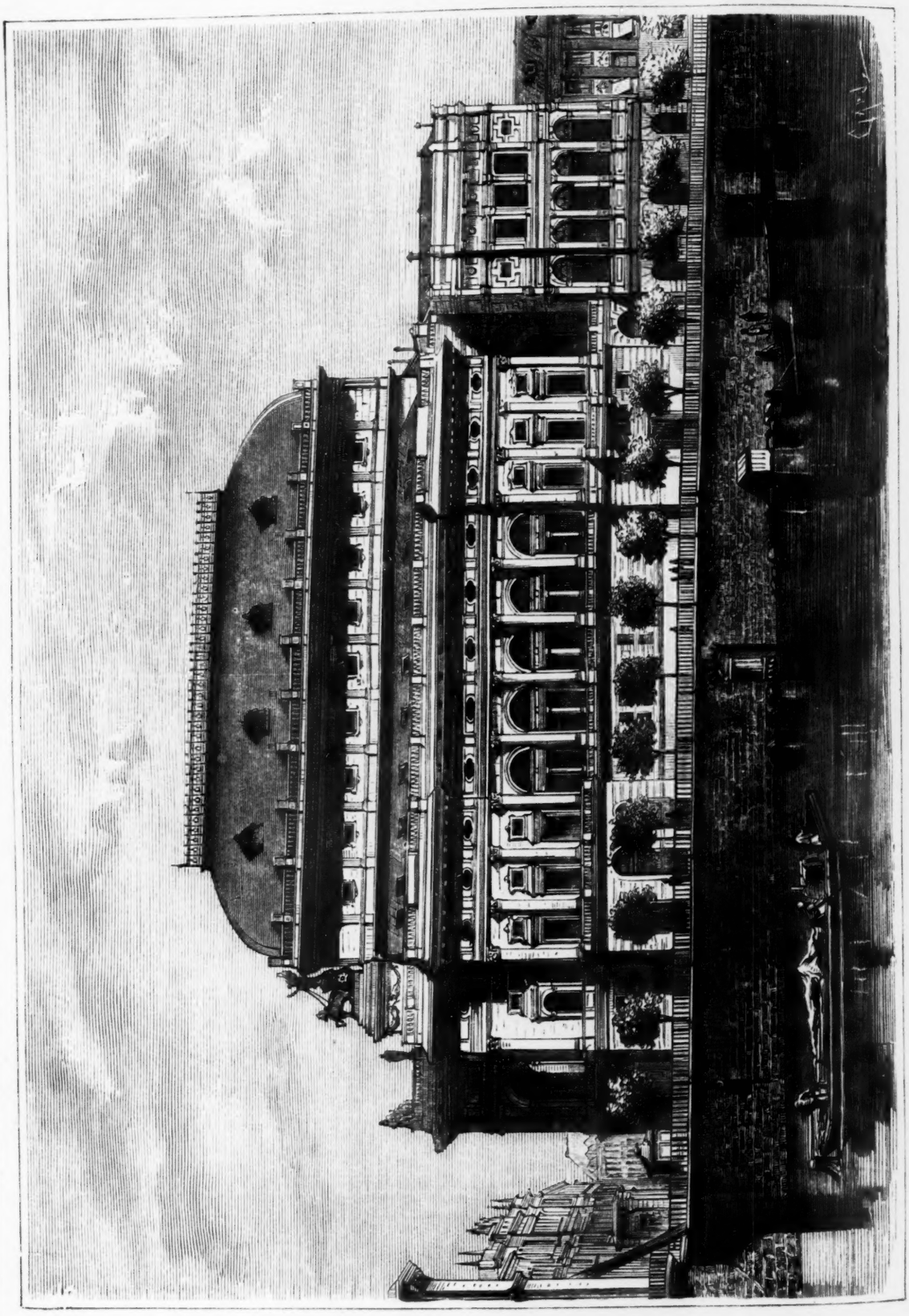
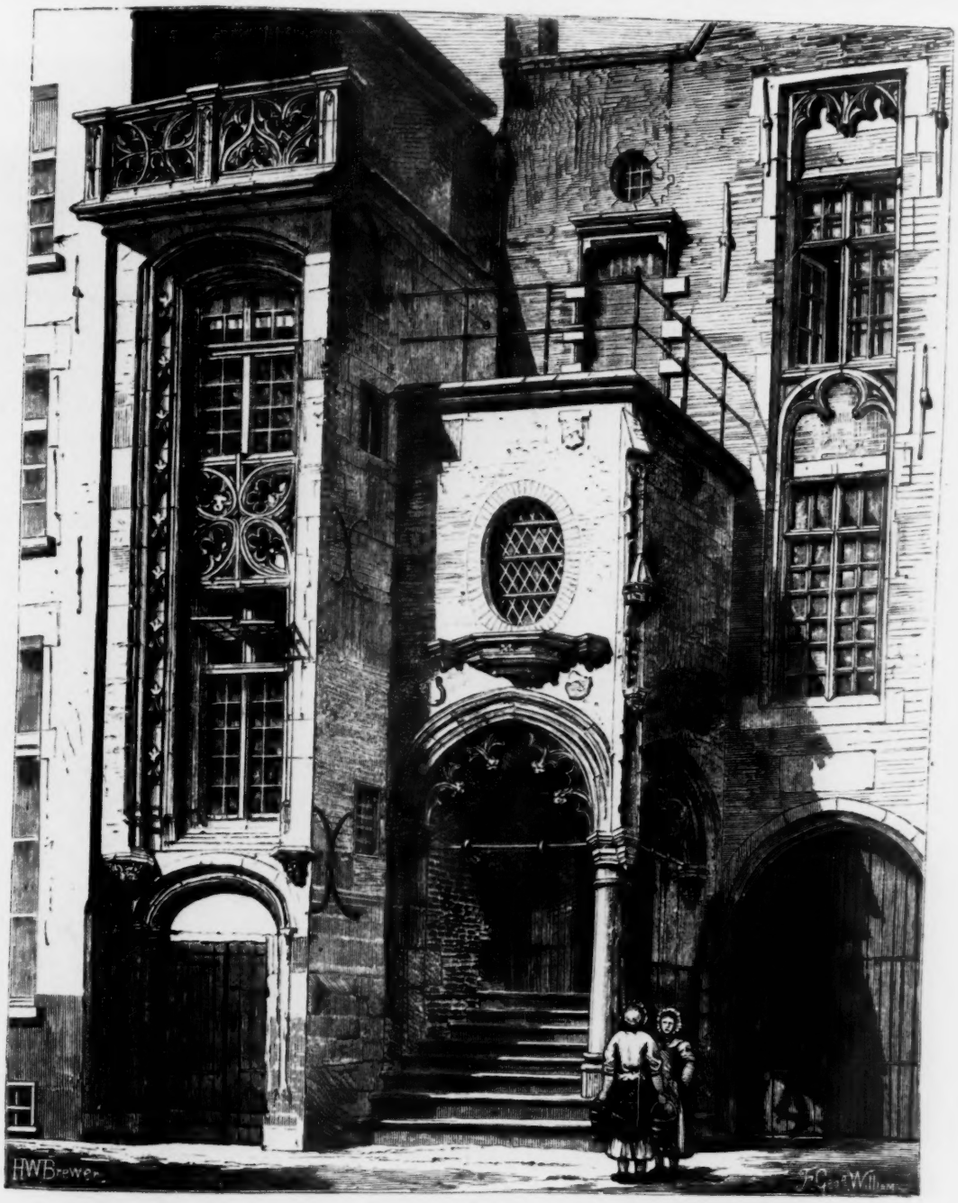


THE NATIONAL THEATRE, PRAGUE.



MEDIÆVAL STREET ARCHITECTURE: HOUSE IN BRUGES.

End of Fifteenth Century or Beginning of the Sixteenth.

SHREWSBURY SCHOOL: MASTER'S RESIDENCE.

THE Shrewsbury School has been removed from its old site across the river to Kingsland. The destination of its old picturesque and characteristic buildings is not yet known. It is now to occupy the large building formerly erected as a charitable institution, and subsequently used as the Union Workhouse. The headmaster's house has been built in the "Queen Anne" style by Mr. Blomfield, and those for two assistant masters by Mr. William White. One of these is given in our illustration. It is built of local red brick, with quoins and moulded arches and other dressings of pressed red bricks. It is covered with plain tiles of brindled tint. It will be seen from the plan that the boys' and the domestic portions are in two distinct wings, with the dining-hall between. The studies are arranged each to take three boys. The studies and dormitories are to be warmed by a circulating system of heated air, combined with the constant provision of pure air.

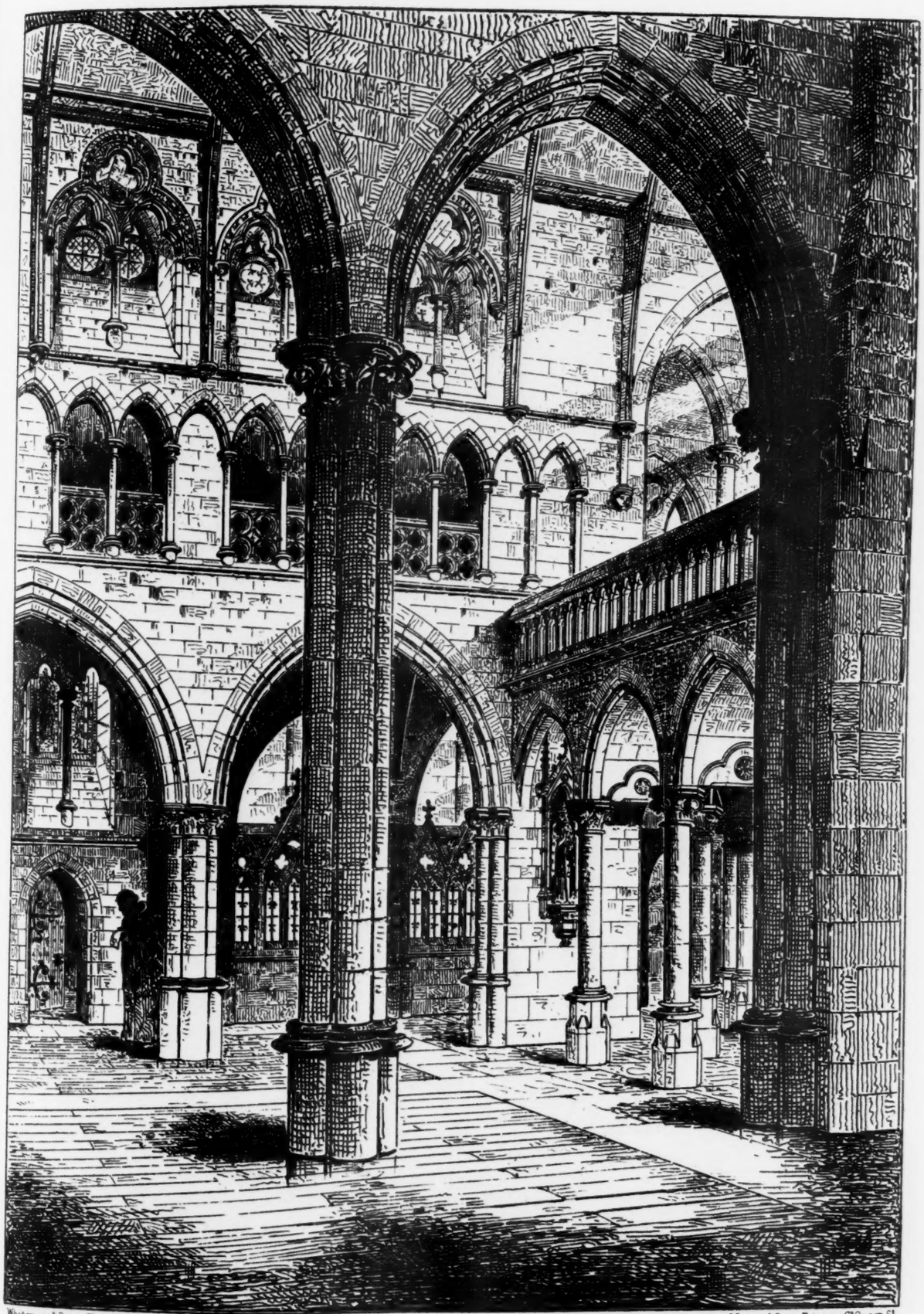
HOUSE IN BRUGES.

THE sketch we give of an old house at Bruges is an elegant example of the domestic architecture of the Low Countries. The date is not clearly ascertainable, but it may be presumed to be a work of the latter end of the fifteenth century, or possibly of the first few years of that which followed. The insertion of the windows into long sunk panels is a favourite device in Belgium, and is at once a cheap and effective method of giving ornament and light and shade to a large gabled front. It is, of course, one of those things which can easily be overdone, and requires a certain delicacy of treatment to look thoroughly satisfactory.

From a constructive point of view, the porch shown is not above criticism, as the thrust of the cusped arch has nothing to sustain it, and is dependent upon an iron tie to prevent its forcing the column which supports the angle of the building out of perpendicular. The builders, however, had the honesty to show this weakness, and, knowing that an iron tie was necessary, they made it a feature of the design. There are traditions at Bruges that Van Eyck and Memling lived in this house, but we were unable to obtain any reliable information upon the subject.

THE NATIONAL THEATRE, PRAGUE, BOHEMIA.

THIS theatre, which had been ten years in building, and was opened about four months ago, was destroyed by fire in August last. The loss is estimated at about 100,000*l*. Its large size and grandiose effect justified the inhabitants in considering it one of the most important monuments of their city. It was intended that plays in the national idiom of Bohemia, the Czech language, should be performed in it, in order to keep alive the sentiment of nationality and the love of country. It is to be rebuilt forthwith. It was insured for about half its cost, and subscriptions, from high and low, are flowing in to complete the amount required.



Whiteman & Bam. *Photo-Litho* 236, High Holborn.

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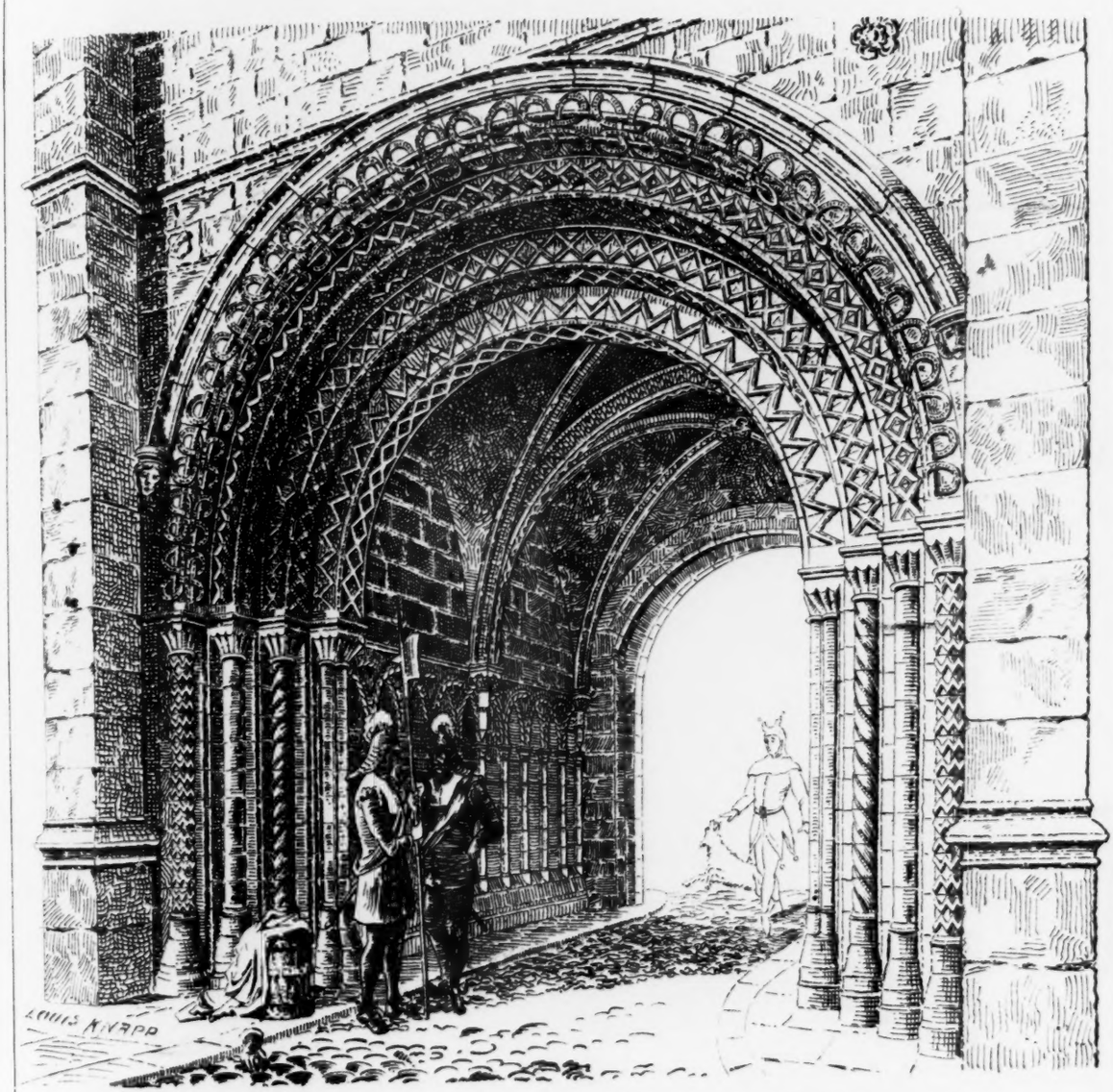
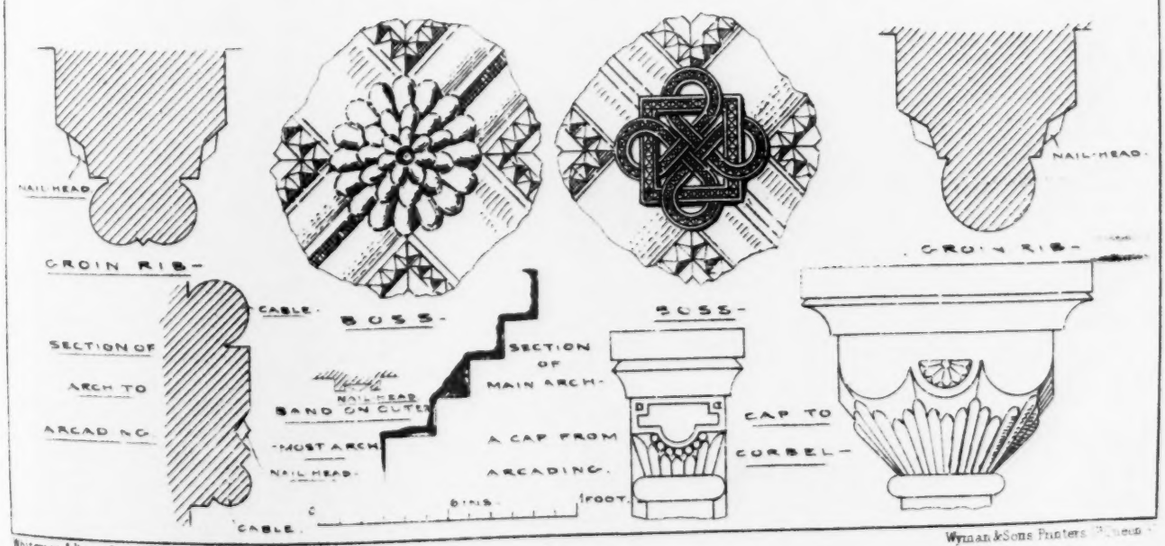
THE R.C. CHURCH OF OUR LADY AND ST. DENIS, AT ST. MARYCHURCH, TORQUAY.

MESSRS. JOSEPH A. HANSOM & SON, ARCHITECTS.



GATEWAY TO S^T AUGUSTINE'S ABBEY - BRISTOL -

WEST VIEW -



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ST. MARYCHURCH, TORQUAY.

VISITORS to Torquay will find pleasure in visiting the now completed R.C. Church of Our Lady and St. Denis, at St. Marychurch, of which the spire is now a prominent land-mark for miles around. In our present number we give an internal view, taken from the north porch looking across the nave and two aisles to the Lady Chapel, which does not occupy the usual place at the east end, but is placed for necessary reasons at the south side of the south aisle, at its western extremity, and measures 30 ft. by 12 ft. To the right of the picture is a large tribune for the orphans under the care of the nuns of the third order of St. Dominic, to whose convent the church is attached. The whole cost of the church, of which a part has been in use some years, has been defrayed by Mr. Chatto. It consists of a chancel, 30 ft. by 20 ft., with nuns' choir on the south side and sacristies and presbytery on the north; nave, 103 ft. 6 in. by 22 ft. 3 in.; north aisle, 88 ft. 6 in. by 12 ft. 6 in.; and south aisle, 103 ft. by 12 ft. 6 in.; the Lady Chapel already alluded to; and the tower and spire at the west end of the north aisle, the baptistery forming the lower part. The internal dimensions are 133 ft. by 47 ft. 3 in. The church is built in local limestone and Chudleigh limestone, with Box-ground and Westwood-ground dressings outside, and Corsham Down inside. The Bath stone was supplied by Messrs. Randell & Saunders. The spire is, however, all built in Portland stone, and terminates in a copper cross, which communicates with and forms part of the lightning conductor, which is a ribbon 4 in. broad by ⅛ in. thick. The top of the cross is 176 ft. above the floor level, which is nearly 300 ft. above the level of the sea. The entasis of the spire is peculiarly graceful, being a rise of 9 in. in 90 ft.

Mr. Eddles, of St. Marychurch, took the contract for the completion of the building at 10,146*l.*, but several additions have been subsequently made. Those concerned had to deplore his loss during the course of the works, and they have since his death been carried on by his sons and executors, Messrs. William & Jesse Eddles. Mr. Condy is the clerk of the works.

The altars and statuary are by Messrs. Farmer & Brindley, Mr. Earp, and Mr. Boulton, most of the foliage being very creditably done by Mr. Jackman, of St. Marychurch. The font was carried out by Mr. Blackler, of St. Marychurch, and is, together with its steps, of polished local limestone in different colours. The whole of the works are from the designs of Messrs. Joseph A. Hansom & Son, architects, of 27, Alfred-place West, South Kensington; and since the retirement of Mr. Hansom, sen., from the firm, the works have been carried on under the superintendence of Mr. Joseph Stanislaus Hansom, F.R.I.B.A. The copper cross on the spire was executed by Messrs. Hart, Son, Peard, & Co., from the designs of the architects.

The church is now in regular use, but no bells are as yet placed in the tower. It is proposed to have carillon chimes.

THE ABBEY GATEWAY, BRISTOL.

THIS remarkably beautiful example of Norman architecture originally formed the entrance to St. Augustine's Abbey, which is now known as Bristol Cathedral. It is in a wonderful state of preservation, the whole of the detail, save such as is within about 2 ft. 6 in. of the ground, being nearly as perfect as on the day when it was placed there. It would appear to have been erected during the reign of Henry II., as a superstructure of the Perpendicular period of architecture, and built at the expense of one Abbot Newland, or Nailheart, bears an inscription, couched in very ecclesiastical Latin, to the effect that King Henry II and Lord Robert Fitzhardinge were conjointly the founders of the monastery. Their statues and arms are to be seen upon Abbot Newland's building, and also those of Edward the Confessor and Richard de Clare, Earl of Pembroke, the latter two bearing title-deeds in their hands, and Lord Berkeley holding a model of the building. Pembroke's arms are also emblazoned at the high altar of the cathedral, together with those of Lord Berkeley and Henry II., and hence it may be inferred that some religious establishment endowed by Edward the Confessor and an Earl of Pembroke existed previously to the erection of Sir Robert Fitzhardinge's magnificent building.

It is impossible, in viewing this archway, to avoid being struck by the careful thought and painstaking consideration which has been bestowed upon each minutest detail by its twelfth-century architect, as well as by the broadly artistic effect which he has imparted to it as a whole; thus, every fillet maintains a uniform width throughout its length, every nailhead is perfectly cut, and some of the ornaments are undercut in a way that must have cost the workman much time as well as rare dexterity. The arrangement of the carved decoration of the four external members of the chief arch evidences much taste and artistic feeling; round the outer member, and in high light, runs a slightly relieved riband ornament, fantastically twined and knotted around two continuous roll mouldings. Within this, and, by contrast, in the deepest shadow of all, is a member studded with bold lozenge ornaments, so deeply undercut as to stand clearly out against the darkness behind. Within this, again, the decoration, though less vigorously rendered, is sufficiently defined to be easily followed by the eye; and the inmost member of all, which is practically only slightly shaded, is chased with a light chain of zigzags. In the caps of the interior arcade, the architect has freely indulged his fancy, scarcely two of them being alike in design.

The view given is made from carefully measured drawings made by myself some years ago, and might be described as a detail perspective view, the jointing of the stones, as well as the position of each ornament, being faithfully rendered.

LOUIS KNAPP.

MICA.

THIS industry is represented at the Breslau Exhibition in the full extent of its different branches, by the collection of Max Raphael. The fire-proof, glassy, and transparent mineral is found in America in large quantities, but not in sufficient abundance to supply the wants of that market, and hence there is a large export of the article from this side of the Atlantic in the leaf form. It is there mostly used for covering the openings in furnaces, so that the chemical changes which are being produced by the heat can be controlled. It is also used for purposes of a domestic nature.

Mica is found in Ural and Finland. The Swiss and Tyrolese Alps produce the most favoured descriptions, which are also worked up in Thuringia into the forms required for commerce. The raw material is in the shape of thick leaf-formed slabs, which can be divided to form almost any degree of thinness, and it is in different shapes and thicknesses that the article is packed for export to America, this being a main feature of the trade. Another use to which it is put is the decoration of pottery.

The immutability of this product, its resistance to heat and damp, the readiness with which it receives impressions of colours, photographs, &c., enable it to be put to a variety of uses.

Herr Raphael does not confine himself to supplying the material, but in many cases sends the article out in its manufactured state. It is used in telephones, and for ventilators it is preferred to metals, as they are liable to oxidation. It is also used for more complicated purposes in lamps, &c., in cases where glass has hitherto been employed.

There is, however, a limit to its applications, and one of our foreign contemporaries remarks that the church-windows, with paintings and shadings, which are exhibited, cannot be considered as producing the effect of painting on glass, although in themselves they are interesting trials.

There is another exhibitor of this article, Jaroslaw, who shows some handsome lamp-shades, which, besides being ornamental in themselves, have the advantage of not curling with heat, as is the case sometimes with shades composed of paper.

St. Paul's, Brixton.—The above church was consecrated on the 29th ult. It is situated in the Ferndale-road. It was built by Mr. Jones, of Gloucester, from the designs of Messrs. Habershon & Fawckner, of Bloomsbury-square. The lighting arrangements were carried out by Messrs. Jones & Willis, of London and Birmingham, and we are informed that the same firm supplied the other interior fittings.

THE BRITISH ARCHÆOLOGICAL ASSOCIATION IN THE WEST OF ENGLAND.

CONCLUDING our record * of the proceedings in connexion with the Malvern Congress of this Association, we have to note that on Saturday, the 27th of August, there was an excursion to the Herefordshire Beacon, Midsummer Hill, Bronsil Castle, and Eastnor Castle. Little Malvern was the first place visited, and here sketchers were charmed by the church-tower. Mr. Daniel Parsons read a paper, stating that it was certain that the church began to exist as far back as 1125. He had examined the original register of the Priory of Worcester. Little Malvern was given by the 27th Bishop of Worcester to the Benedictines, who were the great church-builders in Worcestershire. The Bishop retained jurisdiction over the place. In 1171 two brothers came over to Little Malvern and founded the church. No dedication of the church had taken place up to that date. In 1237 a Provincial Council held in London ordered that all churches built with walls perfect should be consecrated within two years. In the Malvern district the difficulty of getting materials must have been almost insuperable; and to that he attributed the delay in consecration. In 1182 the dedication took place. The Bishop preached in the Chapter-house, and his text was still preserved. In 1480 the discipline of the house had become relaxed. Nash stated that the monks had become people of bad character; but this was not the case. In 1534 the monks were compelled to give up their jurisdiction, and the property was afterwards given by deed to a member of the Russell family. Mr. Parsons described in detail the painted glass of the large window, showing sympathies with the House of York. It was mentioned that the preservation of one of the windows was due to the late Mr. Albert Way. Mr. Parsons also described the tiles, including one which is also found at Great Malvern, with the following inscription:—"Thenke mon thi liffe mai not eu endure: that thow dost thi self of that thow are sure: but that thow kepist un to thi sectur [executor's] cure: and eu hit [it] availe the hit is but aventure." The date of this tile is about 1450. After looking at the church, the excursionists, under Mr. Berington's guidance, visited Little Malvern Court and gardens. A large number went beneath the enormous lime-tree, under which, on one occasion, 183 persons were assembled. The branches trail all around on the ground. This is supposed to have been caused by weights placed on the tree. Mr. Berington stated that the tree was not much more than 150 years old.

From Little Malvern the party proceeded to the Wind's Point, where they left the carriages in order to inspect the two great camps of the Malvern Hills. Like some Dover or Namur of the olden days, the great hill fortress of the Herefordshire Beacon frowns upon the valley below. Its belt of ramparts having been passed, the archæologists at length reached the great central mound, from which, the day being clear, there was a magnificent view of the country for many miles around. Mr. J. Tom Burgess pointed out the various objects of interest in the distance. Mr. Edwin Lees, in a paper which he read on the hill, maintained that the camp was of two ages, and the work of two separate tribes. He attributed the greater part of the camp to an age prior to the Romans. He thought the camp was held by the Welsh, and pointed out that it was not until the days of Athelstan that the Welsh were driven from the Malverns across the Wye. To this latter period belonged the golden coronet which was found at Burstner's Cross. Mr. Lees gave an account of the finding of the crown, and quoted Card, Nash, and other writers. He had fought many battles on the hill, and was prepared to hold his own against any theory of Caractacus having been there. Sir J. A. Picton pointed out that there were people in this country before the Celts, and that they naturally occupied the high points for defence. He thought the camp might have been occupied by various peoples at various times.

Mr. J. Tom Burgess maintained that the camp was one of the frontier fortresses of the Silures. On the opposite side of the valley was Bredon Hill. This, from the remains found upon it, was undoubtedly one of the outposts of the Romans in the time of Ostorius, and along the whole line

* See pp. 265, 311, *ante*.

of hills, which stretched from Bredon to the south, every point of vantage once bristled with Roman watchfires. In a direction due east there was another line of earthworks and fortresses, which were the frontier line of the Cornabii. Their remains could be traced along the eastern bank of the Severn; and looking to the north in the far distance was the Wrekin, which was the capital of that tribe. A little farther to the west could be seen a line of fortresses, which might be attributed to the Silures. Far away to the south was the Bristol Channel, which represented the southern end of their territory. The Herefordshire Beacon was about the centre of that line, and the camp was one of the largest fortresses in the country. During the nine years' war which Caractacus waged against the Romans, and, indeed, during the whole of the twenty-five years which elapsed from the landing of the Romans to the period of the subjugation of the people in whose ancient territory they now stood, there must have been conflicts going on in that neighbourhood.

From the Herefordshire Beacon, the archæologists walked across the hills, under Mr. Wilson's guidance, to the Midsummer Hill. Mr. Burgess pointed out that the hill probably took its name from the Midsummer or Beltane fires. It was afterwards suggested by Mr. Piper that the old name of the hill was Bronsil, a name surviving in the castle in the valley below. The ramparts of the camp and the hollows, where formerly there were habitations, were pointed out. At the Holly Bush Pass the excursionists took carriages and drove to Bronsil Castle. Of this fine old castle of the fifteenth century nothing now remains except one of the round towers. The old fragment of stone, the clear, broad waters of the moat, and the tangled vegetation, make up a pretty picture. The castle was a double-moated one. The outer moat, however, now only remains. Mr. G. H. Piper read a short paper on the history of the castle, mentioning that it was built by Richard, son of John, first Lord Beauchamp of Powyke. It was suggested by one of the party that probably the area was moated before the Conquest. Mr. Burgess did not think that moated areas were generally to be traced further back than the time of Stephen.

After a beautiful drive by the side of Eastnor Park, with its almost unrivalled herd of 800 deer, the Somers Arms was reached, where luncheon was partaken of, and the visitors afterwards wended their way to Eastnor Church, where the monuments to various members of the family of Earl Somers were scanned.

From the church it is not a long walk to Eastnor Castle. This was commenced in the earlier part of the century, and is built in the old baronial style. The former castle stood at the west end of the present lake.

At the evening meeting in Malvern, Mr. G. H. Piper read an account of the excavations which were made on the Herefordshire Beacon in September, 1879. In one hut, hollow pottery, and the bones of the horse, sheep, deer, and other animals, were found. These were exhibited on the table. At the same meeting, a paper by the Rev. W. S. Symonds on "The Battle of Tewkesbury" was read by Mr. Wright. As this meeting, strictly speaking, terminated the Congress, votes of thanks were given to the President, Lord Alwyne Compton, and to many other gentlemen, for services rendered in connexion with the week's proceedings.

Extra excursions and meetings took place on Monday, Tuesday, and Wednesday, the 29th, 30th, and 31st of August. On Monday a visit was paid to Worcester, where the members were received in the Guildhall by the Mayor (Alderman Townshend). Alderman Noake gave a short account of the Guildhall, mentioning that Thomas White, a pupil of Sir Christopher Wren, was its architect. He also described the pictures, including that of Sir John Pakington, the fourth baronet of Westwood, and that of George III. by Reynolds. The various charters of the city had been carefully laid out on the tables by Mr. S. Southall. Mr. W. de Gray Birch, F.S.A., said that this was one of the best collections of charters they had seen in their rambles for many years. The first charter was that of King Richard I., written in the beautiful handwriting of that period. In this charter the city of Worcester was called a ville. The burgesses were to pay 20*l.* yearly to the exchequer, and for that they were to do as they pleased within the city. The charter was witnessed by the Archbishop of Canterbury and other nobles, and was dated 1189. The second charter was most important as far as the liberties of the city were concerned. Worcester was here called a *civitas*, and the inhabitants were described as citizens. The charter was dated the 11th year of Henry III., and was witnessed by the Bishop of Bath and other dignitaries. This charter granted various immunities. It gave permission for a merchant guild with hanse; it provided that no one should bring merchandise into the town without permission; and it also granted scot and lot, stallage and tollage; 30*l.* per annum was to be paid to the exchequer. Appended to it was one of the finest specimens of the weaver's art to be found in England. He congratulated the Corporation of Worcester on the excellent way in which the charters of the city had been preserved. Mr. Birch then read a portion of a paper on "The Anglo-Saxon Charters of Worcester Cathedral." The cathedral church of Worcester was, he said, justly celebrated for its Anglo-Saxon literary treasures. Saxon charters were a grand record of our insular history; and to them we must look for nearly all our information respecting real property and many other matters. They were also of value as illustrating the minuter details of early English history. It was the work of the Teutonic races to infuse vigour and sanctity into institutions that were perishing through their own corruption. Roman law looked to the individual member of the State. Teutonic law based itself upon the family bond. It was highly probable that the Saxons had symbolic means of effecting the transfer of land. The Runic characters, in use up to the arrival of Augustine, then gave way to the Roman writing. In the time of Wulstan there were between 200 and 300 Saxon charters in the monastery of Worcester. Wulstan ordered the deeds to be transcribed. Of these nearly one-half were now unknown, except in the form of transcript. There were twenty original Anglo-Saxon charters of Worcester in the British Museum. With the exception of Christ Church, Canterbury, no other cathedral or monastery had contributed so many original Saxon documents to the Museum. Mr. Birch, having given some details as to the Worcester Anglo-Saxon charters, said that the total number of Anglo-Saxon charters preserved was very limited, perhaps not exceeding 2,000. These documents were beginning to show signs of decay, clearly foretelling that the time would come when a Saxon charter would be no longer in existence. What students really required was a *corpus* of these charters. This work, which Kemble almost accomplished, should now be undertaken by a society.

From the Guildhall the visitors walked to the Cathedral, where the Dean gave a short account of the history of the fabric, acknowledging his obligations to the description by Professor Willis. The church built by St. Oswald in the tenth century had entirely disappeared. At the time of the Conquest Wulstan was Bishop of Worcester. An attempt was made to dispossess him, but in the end he was retained. Wulstan determined to rebuild the cathedral church, and began the work in 1084. In 1092 he held a synod in the crypt, which, said he, "I have built from the foundations." The crypt was, therefore, a dated example of Early Norman architecture. In 1203 Wulstan was canonised. In 1216 King John died; and before his death he said he commended himself to God and St. Wulstan, the last great English saint. In 1218 the cathedral was solemnly dedicated. That was the Norman cathedral, and probably the building had been going on from the days of Wulstan. The Norman work remaining was interesting as giving the key to the construction of the building. The Norman cathedral was exactly of the same size westwards as the present cathedral, with the pillars in the same places. The apse of the Norman choir was near where the tomb of King John now stood. In 1224 the foundation of the new choir was laid. Between 1317 and 1321 the north aisle of the nave was built by Bishop Cobham. As a whole, the cathedral was completed by the year 1400. The Dean then conducted the party over the cathedral, pointing out the remains of the old Norman building in a blocked-up arch over the marble string-course of the choir, and in the arches of the south choir aisle. Mr. Loftus Brock was of opinion that the latter were part of Wulstan's building, especially from the wide joints; but he thought that the carving was of later date. It was suggested by a member of the Architectural Association, when visiting the cathedral a week or two ago, that the passage to the north of the Chapter-house was a fragment of the Church of St. Oswald, and, therefore, was tenth-century work. Mr. Loftus Brock pronounced against this theory. Mr. Lynam thought the work the earliest in the cathedral, and ante-Norman. In the Chapter-house the Dean mentioned that the round Norman arches were still behind two of the Perpendicular windows. The Dean, in replying to a vote of thanks, mentioned that the total cost of the restoration of the cathedral was 130,000*l.*

On Tuesday the last Worcestershire excursion took place. Leaving Worcester in carriages, the archæologists drove through Whittington to Cruckbarrow Hill. Clambering up the hill-side they soon reached the top, from which, when the weather is fine, there is a beautiful view. Mr. J. Tom Burgess said that Cruckbarrow was one of about twenty hills he knew with this name. This was a marl-stone hill, which appeared to have been escarped as a beacon between the Malvern Hills and a series of earthworks extending along the valley of the Severn. After a long drive past Spetchley and Broughton Hackett, the carriages drew up in front of Huddington Court and church. The church was first inspected. Mr. Loftus Brock said that it was not often that they saw a church in so unaltered a state. Archæologists though they were, they must be grateful to think that, probably through the work of their own society, and other kindred societies, the taste and regard for old churches had been so much developed that there were now few opportunities of seeing churches in such a poor condition as Huddington. The church, however, was interesting as an example of the little village church of the early part of the fourteenth century, in which fewer alterations of a later date had been made than was commonly the case in such buildings. The building was not unworthy of study. It contained the original timber roof, which, if the plaster were taken off, would be seen to great advantage. It was surprising what a different effect would be produced by the outlay of a few hundred pounds. He hoped their visit would result in drawing attention to the church and preserving it. It was apparent that, unless something were done, a catastrophe would occur to its bulging walls and rotten timbers. The church contained a chancel-screen of Jacobean date. The tiles of the floor were of very great beauty, but there were now only about a dozen in anything like a state of preservation. It was seldom they saw a porch of so early a date in such a good state of preservation. He considered it to be as old as the church. The hall was, as in many other cases, near the church. The lord of the manor in the old times was the patron and father of the village, looking after his own comforts in the hall and the spiritual welfare of the people. The ladder was of the same date as the porch.

Mere Hall was next visited. It is one of the finest specimens of the timbered houses for which Worcestershire is famous. Different opinions were expressed as to the date of the building. The house bears the date 1337. Mr. Loftus Brock and Mr. Reynolds thought that the building was erected in the time of Charles I. Other gentlemen thought that it was Elizabethan. Mr. Brock said that it was a matter of considerable gratification to him to stand beneath the roof of that house, not only because it was a specimen of the black and white house so common in the district, but for personal reasons which it was pleasant for him to remember. On the disforesting of that district, it appeared that oak was so abundant that farm-houses and even cottages were erected with it. On the building was the date 1337. His own impression was that the date was placed there for a sort of double purpose. The date of 1637 so nearly fitted in with the style of the house as to justify them in believing that the house was erected at that time. The house was figured in Habershon's "Half-Timbered Houses." He had referred to his personal feeling in being in that house. Under the direction of his late partner's father, Mr. Habershon, the house received certain alterations and additions to adapt it for the purposes of a modern residence. Probably it was to Mr. Habershon that they owed the existence of the house at all. It had been stated that Mr. Habershon covered the new work of the house with black and white stripes, in imitation of the old work. They might depend upon it that the work was originally erected without those stripes, as Mr. Habershon would be the last man to create an architectural sham. It

was a matter of gratification to see that Mr. Bearcroft, the owner, had done so much to uphold and preserve to future generations so interesting a specimen of a style of architecture which was every day disappearing. Apart from the cordial reception Mr. Bearcroft had given them, they owed him a debt of gratitude for the care he had bestowed on the house.

From Mere Hall the party drove to Droitwich, where luncheon was provided at the Raven Hotel,—a building of some archæological interest. At St. Andrew's Church the Rector was in attendance to receive the visitors. The whitewash in this church, though it mars, does not conceal the original beauty of the mouldings and carvings. Mr. J. Tom Burgess said that Droitwich was believed to be the Salinæ of the Itinerary of Richard of Cirencester. There were indications that in ancient times it was a city of considerable importance, arising from its salt springs. A tesselated Roman pavement found at Droitwich was preserved in Worcester Museum.

From Droitwich the archæologists drove to Salwarpe, where Canon Douglas and Mr. J. T. Mence received the party. The nave of the church is late twelfth-century work. One of the most striking points of the excursions has been the immense quantity of work of the Transition period between Norman and Early English that has been seen. The latter half of the twelfth century was evidently a great church-building period in Worcestershire. To the Norman nave of Salwarpe beautiful Decorated aisles have been added. In the chancel, which was rebuilt in 1848, there is a well-preserved recumbent effigy of the beginning of the fifteenth century. The parish chest encloses some curiosities, which were shown by Mr. Douglas. From the church it is only a few yards' walk to the Court House. The present house was probably erected about the time of Henry VII. About that time, or later, the house was granted to the Talbots. Salwarpe Court, like many other fine houses in the district, has its herring-bone brickwork painted white. It is the opinion of some architects that the effect of these old houses would be heightened by leaving the brickwork untouched.

On Wednesday the members of the Association and their friends made the last excursion. They proceeded by an early train to Cheltenham, where the doors of Thirlestaine House were thrown open by the courtesy of the Rev. J. E. A. Fenwick, M.A., and the trustees of the late Sir Thomas Phillipps, bart., and the party were permitted to inspect the valuable library and interesting pictures which used to be so fondly treasured at Middlehill. Some of the choicest MSS. of this vast collection were exhibited in one of the rooms. Mr. E. Maunde Thompson, F.S.A., the keeper of the MSS. in the British Museum, explained, in a brief address, the value and importance of these and other rare works in the library, which were unequalled outside the national collection.

After lunch, which was partaken of at the Plough Hotel, Mr. T. Morgan, F.S.A., hon. treasurer, who presided, moved a vote of thanks to Mr. J. Tom Burgess, F.S.A., for his valuable services during the excursions. We may add that for a portion of our notes of the proceedings of the Congress we are indebted to the columns of the very old-established newspaper known as *Berrow's Worcester Journal*, which, dating back to 1690, is the oldest existing provincial newspaper in the kingdom. Mr. J. Tom Burgess is its editor.

DRAWING IN AMERICA.

We have received from America the "Annual Report on Industrial Art Education in the State of Massachusetts for the year 1880," and "Plan and Graded Programme on Instruction in Drawing for the Public Schools" in the same State, both by Mr. Walter Smith, State Director of Art Education in Massachusetts. They are valuable and interesting documents, and show the thoroughness with which Mr. Walter Smith is pursuing his work.

The following propositions define the position taken on this question of industrial drawing in the public schools:—

"1. All children who can be taught to read, write, and cipher, can be taught to draw.

2. Drawing, by the law of Massachusetts, is required to be taught to every child as an element of general education, like reading, writing, and arithmetic.

3. As an elementary subject, it should be taught by the regular teachers, and not by special instructors.

4. The true function of drawing in general education is to develop accuracy of perception and to exercise the imagination, thereby tending to produce a love of order and to nourish originality.

5. Educationally, drawing should be regarded as a means for the study of other subjects, such as geography, history, mechanics, design. In general education it is to be considered as an implement, not as an ornament.

6. The practice of drawing is necessary to the possession of taste and skill in industry, and is therefore the common element of education for creating an enjoyment of the beautiful, and for a profitable, practical life.

7. In the primary, grammar, and high schools, drawing is elementary and general; in the normal and evening schools, advanced and special,—for teaching purposes in the first, and for skilled industry in the second.

8. Good industrial art includes the scientific as well as the artistic element; science securing the necessity of true and permanent workmanship, art contributing the quality of attractiveness and beauty. The study of practical art by drawing should therefore comprehend the exactness of science by the use of instruments, as in geometrical drawing and designing, and the acquisition of knowledge of the beautiful, and manual skill in expression, by freehand drawing of historical masterpieces of art and choice natural forms.

9. Drawing may now, therefore, take its legal place in the public schools as an element of, and not as a specialty in, education, at as little cost as any other equally useful branch of instruction, with the prospect that at a future time as many persons will be able to draw well as can read and write well, and as large a proportion be able to design well as to produce a good English composition."

Mr. Walter Smith, who is an Art Master of South Kensington, was an esteemed correspondent of our own before he went to America, and will be remembered by many of our readers. We send to him across the broad Atlantic our heartiest good wishes.

THE FIRE IN CHEAPSIDE.

THE recent fire in Cheapside and Bread-street leaves after its ravages, and for the short time it must remain before the whole corner is demolished, the ruin of a well-constructed modern stone building, a picturesque and novel sight, such as is scarcely to be found nearer to London than the remains of the Tuileries or the Palais du Quai d'Orsay, destroyed by the Communists in 1871. Bread-street, indeed, had a narrow escape, and with it, a neighbourhood fraught with interesting associations; for, as all Londoners know, it was in this street, within a short distance of the fire, that Milton first saw the light (1608), and he was baptised in the Church of Allhallows in the same street. It was from his father's house in Bread-street that Milton made his first removal in that series of changes of residence in London, all of which are well known,—better known, perhaps, than those of any other great Englishman who has migrated from spot to spot. Milton's house in Bread-street,—before the Great Fire of 1666, in which the whole neighbourhood was destroyed,—was, we have contemporary authority, constantly visited by strangers and foreigners.

The antiquarian associations of this street are great, and such associations always possess an interest even in the midst of the excitement of modern existence. In Bread-street it was that stood, in the days of Queen Elizabeth, the Mermaid Tavern, of poetic memory,—the tavern where met Shakspeare and Ben Jonson, Raleigh and Marlowe, and that set of literary contemporaries who adorned so brilliantly our English Renaissance, whose poetry, while it breathes with all the grace and polish of Classic tradition, rings with the healthy British joviality that endeared the hours spent in Bread-street in the memories of the merry band who filled the quaint bar and back room of the oft-sung Mermaid, in the poetry of whose frequenters the literary student welcomes that first expression, as a polished authority has well put it,* of the growing consciousness on the part of Englishmen of the commercial and constitutional future of this our great country.

It is a further association that may almost be said to belong to Bread-street, that nearly opposite it, in Milk-street, Cheapside, was born the courtly, learned, witty, and unfortunate Sir Thomas More, buried under the quiet shadow of his parish church at Chelsea.

From such recollections of the past the stirring incidents of the present moment are eminently calculated to distract the most concentrated attention. The recent fire in Cheapside, will, we hope, at least afford the benefit of one lesson by which all may profit. The *employés* in Messrs. Copestake's extensive premises, owing to the excellent practice into which they had been drilled by previous rehearsal of the manner in which they were to act in cases of emergency, were able not alone to protect their own property, but to render able assistance to the firemen in their dangerous task. This example is one which should be more largely made known and introduced than is at present the case. In these days of an almost excessive love of athletic exercise, we can imagine no better direction in which an expenditure of young force can be turned than towards such an aim. Our volunteer movement has shown, within only a few weeks, its vigorous vitality. In America every citizen, unless we are much mistaken, is called upon to be either a militiaman or a fireman.

And as we are speaking of America, while, in such an instance as the recent destructive fire in Cheapside, not an imputation can be thrown on the skill of our firemen, it has long been admitted that, across the water, the fire-brigade with its apparatus is more fully organised than here, and that in the case of a building well alight in England little is usually done beyond limiting the spread of the disaster. Should such a state of affairs be allowed to continue? Should not, as one precaution at least, the increased use of the fixed hydrants common in America, running from top to bottom of the huge warehouses, and in which the water-power is ready at any instant on the highest floors, be insisted upon in all new buildings? Must another winter, with its inevitable tale of disasters, pass away without some progress being registered, even in our already well organised and nobly-served Metropolitan Fire Brigade?

As will be inferred from what we have said above, the huge premises of Messrs. Copestake had a narrow escape. Had they got fully alight Bow Church would have been in great jeopardy. The main frontage of Messrs. Copestake's premises is towards Bow-churchyard,—not a wide thoroughfare, what width there is being usually more than half taken up with boxes, bales, straw, and other combustible matter. In fact, it seems to be made a sort of packing-yard. On the south of the church the "churchyard" is continued in the form of a narrow passage running into Bow-lane. In this passage are some large premises occupied, apparently, by a firm of wine merchants or druggists, and it will hardly be credited that this firm seem to be in the habit of stowing a large number of hampers, crates, and boxes, quantities of straw (loose and in trusses), and other highly inflammable matter, to the height of 5 ft. or 6 ft., close against the south wall of the church, under its windows, and even in immediate contact with the very wood of the south door. A fusee or lucifer carelessly thrown down amongst this heap might easily convert it into a large bonfire, and, given a favourable wind and a dearth of water, the Church of St. Mary-le-Bow would soon be "burnt out." The City Church and Churchyard Protection Society might take this matter under its cognisance.

SIR,—Passing along Cheapside shortly after the outbreak of this fire, I was much struck with the inability of the fire brigade to prevent the ignition of houses on the opposite side of Bread-street. It occurred to me that if blankets, or other thick woollen material, could be hung out of the upper windows to overlap those below, the engines could easily keep these saturated, and thus prevent the possibility of firing the woodwork thus covered. The roofs should be similarly protected, and evaporation alone would keep the temperature down. Such a simple process would have saved the premises of Messrs. Cow Hill, & Co., and all those on that side of Bread-street. It would not merely save them from destruction by fire, but the ruin of the stock by water.

If the demand arose, some coarse felt would be manufactured for the purpose, and suitable lengths form part of the equipment of each engine or hose cart.

That the usual means of arresting the spread of fire should be by reducing neighbouring properties to a mass of wet rubbish speaks volumes for the scientific enlightenment of the age we live in. I forbear to speak of fireproof flooring

THOS. C. SORBY.

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* Mr. A. J. Beresford-Hope, M.P., in his inaugural address at the Archæological Congress held in London, 1866.

THE SEWERAGE OF EASTBOURNE.

IN connexion with the recent Sanitary Exhibition at Eastbourne, a visit was paid by a deputation of the Association of Municipal and Sanitary Engineers and Surveyors to the Sea-Wall works, where a discussion was held, after which they proceeded to the Ejector Works at Seaside, where, after reviewing the works, the following paper was read by Mr. C. Tomes, the Town Surveyor, a discussion following:—

Before describing to you the action of the ejector system as applied at Eastbourne, I propose to briefly state the reason for its adoption. The main sewer of the town is for a distance of about 1,400 yards from the outfall towards the town below high-water level, and in consequence of this, like many other coast towns, it is for some hours during the day tide locked. This causes the sewage to back up and be stagnant in the lower part of the town, there not being sufficient time between high and low water for the whole of it to pass away. It was therefore resolved, upon my report to the Board, to adopt Mr. Isaac Shone's ejector system, which, by the use of compressed air, will maintain a constant flow through the outfall sewer both at high and low water. The arrangement by which this is effected I will now proceed to describe. The air for supplying the ejector is compressed by two 14-in. "compressors" invented by Mr. Thomas Sturgeon. These are worked by a pair of high-pressure expansive and condensing engines (the cylinders of which are 10½ in. in diameter), fitted with the Hon. Charles Parson's patent variable expansion gear and equilibrium piston slide valves, the engines being arranged so that they can be run either separately or together. The steam is supplied from two "Kesterton" boilers, provided by Messrs. Tangye Brothers, of Birmingham. The compressed air is passed to the three ejectors for a distance of about 350 yards through 6-in. cast-iron flange pipes, and at the same time air is being stored in the receivers for use during the night if required, thereby effecting a great saving in night labour, and at the same time keeping the ejectors constantly supplied. A reducing valve is placed at the compressing station to regulate the pressure of air required by the ejectors. A connexion between the air receivers and the governor is also made, which, when the pressure in the receivers rises to a certain height, cuts the steam off from the cylinders of the engines and stops them, opening again and allowing the engines to run when the pressure lowers. Air from this station can be carried to any number of ejectors placed at different parts of the town, and at any distance from the compressing station. To pass on to the actual disposal of the sewage. The main sewer, by means of a penstock, is diverted from the direct outfall to the sea, and conducted to the ejectors, which then proceed to work. These consist of hollow cylindrical vessels, 4 ft. 6 in. in diameter by 5 ft. high, which are placed entirely below the level of the sewer, so that the sewage passes by gravitation into them through an 18-in. inlet-pipe, placed on the town side of the penstock. Inside the ejectors are two small cylinders, each being open at one end. The upper one, which is termed the "bell," is suspended with its open end downwards, and the lower one, termed the "cup," with its open end upwards, so that the latter is always filled with sewage. The "cup" and "bell" are connected by a rod, and a small rod passes from the upper one, the "bell," through a stuffing-box in the cover to a lever which acts upon a small slide valve governing the action of the automatic piston valve, so as to alternately admit compressed air to the ejectors and let it escape. When the ejectors are nearly full, the sewage, as it rises, encounters the "bell," closes up its open end, and compressing the air within it, lifts it up, thereby drawing back a small slide valve, admitting air pressure to one, and exhausting at the other end of the automatic piston valve, the outer ends of which act as the motion piston, the middle portion acting as the valve regulating the inlet and exit of compressed air. The piston-valve being thus moved over, opens the port admitting compressed air to the ejector, which forces the sewage out through a delivery-pipe into the sewer, on the sea or outfall side of the penstock, ball valves being placed both on the inlet and outlet pipes to prevent the back flow of sewage. The "cup" and "bell" arrangement being balanced, and the weight of sewage in the cup being neutral so long as it is submerged, retains its position until the ejector is nearly empty, and the sewage begins to pass below the cup. The dead weight of sewage in the cup then acting downwards pulls the cup and bell down, reversing the small slide valve, and so, shooting the piston-valve over to the opposite side, shuts off the compressed air and opens the ejectors to the exhaust. The compressed air at once rushes out, allowing a fresh charge of sewage to enter the ejectors, and the action is repeated. Valves are placed both on the inlet and outlet pipes of the ejectors, so that they may be readily disconnected and worked separately. In conclusion, it will be seen by this that the action of the ejectors is entirely automatic and depending upon the rate of flow of sewage. In full work each ejector will fill and discharge in one minute; but during the hours of minimum dry-weather flow the ejectors will be much longer in filling, thus doing only as much work as is actually required. The population of Eastbourne is 24,000, and putting the quantity of sewage to be disposed of at 40 gallons per head, the amount of sewage to pass through the outfall sewer will be 960,000 gallons per day. As I have before mentioned, the ejectors are capable of filling and discharging once in each minute, and their combined capacity being 1,500 gallons if the engines run 10 hours per day, they will dispose of 900,000 gallons in the 10 hours, air being stored at the same time in the receivers at six effective atmospheres. The receivers will contain at this pressure 50 charges, each of which will eject 1,500 gallons, making a total of 75,000 gallons which can be disposed of automatically during the night; the average thus disposed of by the ejector during the day and night amounting to 975,000, or 15,000 gallons in excess of the present requirements.

THE WANDSWORTH NEW PUBLIC HALL.

THE new Vestry and Public Hall, which has for some time past been in course of erection in High-street, Wandsworth, is now fast approaching completion, and it is expected that it will be ready for opening in about a month. The building has an elevation to High-street of about 60 ft. in width, and upwards of 50 ft. in height, with a tower at the west end 80 ft. in height to the top of an ornamental cresting. The main face of the elevation is in red brick, with Dumfries stone dressings and ornamentation, in which some elaborate carving is introduced. This more especially applies to the three lofty windows overlooking High-street, from which the public hall, the principal room in the building, is partially lighted. Between and on each side of these windows there are fluted pilasters, having carved capitals. The central window is surmounted by an ornamental pediment, whilst the two windows on each side of it have segment-arched heads. The elevation is surmounted by a gable in Dumfries stone, with vases on either side; behind rises a high-pitched roof. The lower part of the elevation is arched, forming an arcade and covered carriage-way leading to the entrance-hall of the building.

The building internally contains a large number of apartments, adapted for the various purposes to which they are intended to be appropriated. The principal approach to the building leads into an entrance-hall 18 ft. square, on the right hand side of which is the vestry-clerk's private office, an apartment 17 ft. by 19 ft., together with several clerks' offices and committee-rooms adjoining; and in the rear of the building, on the ground-floor, is the board-room for the general meetings of the vestry. This apartment is 31 ft. in length and 19 ft. in width, and is at present receiving its fittings. The floors of the entrance-hall and those of the several corridors on the ground-floor are all laid with Minton's encaustic tiles. In the basement of the building is the heating chamber, from which the whole of the building is heated and ventilated, the heating apparatus having been supplied by the Thames Iron Company. Strong-rooms have also been constructed in the basement, from which there is a lift to the public hall and to the upper portions of the building. The public hall on the first floor is approached by a stone staircase 5 ft. in width, having ornamental cast-iron balusters. This apartment, which is the principal room in the building, is 73 ft. in length and 38 ft. in width, exclusive of the stage or platform, which is 12 ft. in depth and 20 ft. in width, the extreme length of the hall being 85 ft., running the entire depth of the building from the High-street frontage to the rear. The hall is lighted by a range of six windows on the east side, in addition to the three windows in the High-street elevation already referred to. It is 25 ft. in height from the floor to the ceiling. The floor of the hall is fireproof, constructed on Fox & Barrett's principle. The hall is being decorated. It has a coved ceiling divided into panels, which are being painted in varied delicate tints, with gold enrichments. A frieze of festoons is carried round the room immediately under the coved ceiling, and the walls are divided into large panels by double pilasters with ornamental gilt capitals. In connexion with the hall, on the west side, there are several ladies' and gentlemen's retiring-rooms and committee-rooms. It is computed that the room, which is intended for public meetings, lectures, concerts, and other entertainments, will have accommodation for about 1,000 persons.

The architect of the building is Mr. G. Patrick, of Drummond-chambers, John-street, Adelphi; and the contractor, Mr. Parsons, of Wandsworth. The cost of the building will be about 9,000*l*.

PATENT RECORD.*

APPLICATIONS FOR LETTERS PATENT.

3,606. C. D. Abel, Southampton-buildings. Metallic structures suitable for barracks, workshops, and other buildings. (Com. by La Société Nouvelle de Construction, Paris.) Aug. 19, 1881.

3,620. J. Craig, Kilmarnock. Dressing enamelled bricks, tiles, or slabs. Aug. 19, 1881.

3,629. C. Drake, Battersea. Baths. Aug. 20, 1881.

3,630. C. Drake, Battersea. Facing bricks. Aug. 20, 1881.

3,633. S. Mead and J. W. Tiptaft, Birmingham. Adjusting action for toilet-glasses, swing-sashes, doors, &c. Aug. 20, 1881.

3,648. W. H. Stephenson, Blackburn. Heating apparatus. Aug. 22, 1881.

3,689. W. H. Windsor, Brentwood. Bolt for fastening doors. Aug. 24, 1881.

3,693. H. C. V. de Ahrbecker, and H. E. J. Hamkens, Lambeth. Fluid meters and ball-cocks. Aug. 24, 1881.

3,707. W. R. Lake, Southampton-buildings. Water-closet apparatus. (Com. by the Hartford Sanitary Plumbing Company, Hartford, U.S.A.) (Comp. spec.) Aug. 25, 1881.

3,708. A. C. MacLeod, Shrewsbury. Floors or surfaces for skating upon. Aug. 25, 1881.

3,713. C. D. Douglas, Glasgow. Baths. Aug. 25, 1881.

NOTICES TO PROCEED

have been given by the following applicants on the dates named.

August 23, 1881.

1,367. T. Wrigley, Chancery-lane. Construction of ceilings. (Com. by S. Müellor, Nürnberg.) March 28, 1881.

1,690. W. G. Sloane & J. Sloane, Dublin. Apparatus for heating and ventilating drying-rooms, &c. April 19, 1881.

1,812. A. E. Carey, Newhaven, and E. Latham, Birkenhead. Manufacture of concrete, &c. April 27, 1881.

1,854. J. M. Day, W. R. Green, & H. C. Walker, Great Dover-street. Construction of lifts and hoists, &c. April 29, 1881.

2,653. W. Barton, Boston. Stoves. June 17, 1881.

3,020. W. Howitt, Ilford. Sash-bar for the roofs, &c., of horticultural buildings, &c. July 9, 1881.

August 26, 1881.

1,817. Mr. W. E. Gedge, Strand. Artificial stone. (Com. by G. Boden, Atlantic City, U.S.A.)

2,276. J. McI. Shaw, Glasgow. Kitchen-ranges. May 24, 1881.

ABRIDGMENTS OF SPECIFICATIONS

Published during the Week ending August 27, 1881.

162. T. Rowan, Ryde. Ventilating buildings.

An air inlet box is provided, having two divisions, one filled with coke, the other with dry charcoal, limestone, &c. The air is made to pass through these, whereby it is purified. From this box a shaft leads the air into the building or room. Just above the end of this air inlet pipe is the mouth of the air ejecting pipe. This pipe is led to above the roof, where it terminates in a cowl, which

* Compiled by Hart & Co., Patent Agents, 28, New Bridge-street, E.C.

produces an induced current of air up this pipe. Jan. 13, 1881. Price 6d.

243. J. Shanks, Bristol. Discharge apparatus for water-closet and similar cisterns.

The cistern is fitted with a syphon discharge-pipe, the short leg of which has a conical mouth. Beneath this is placed a cup, which fits it, which cup is connected to the closed handle. The water in the cistern is a little below the bend of the syphon, but when the cup is raised, the syphon is brought into action. (*Pro. Pro.*) Jan. 20, 1881. Price 2d.

244. J. McAlister, Barrhead. Apparatus for heating water.

A number of tubes are employed which are of a long narrow section, the broad sides being placed vertically, and the water travels backwards and forwards through these in succession, being all the time exposed to the heat. (*Pro. Pro.*) Jan. 20, 1881. Price 2d.

248. E. de Pass, Fleet-street. Apparatus for heating by hot water and steam.

The steam, being raised in the boiler, is led to the room to be heated, and then taken through a surface heater filled with water. This is heated by the partial condensation of the steam, and the condensed water flows back to the boiler through a special system of pipes. The surface heater communicates with the hot-water stove by which the room is warmed, which thus absorbs the heat of the steam, and imparts it to the room. (Com. by E. Körtling, Hanover.) Jan. 20, 1881. Price 6d.

251. G. Whitehead, Heywood. Archimedian ventilators.

This relates to those ventilators which have revolving tops and screws or fans, and has outlet passages between the screw, and the revolving top, to prevent any down-draught. (*Pro. Pro.*) Jan. 20, 1881. Price 2d.

254. L. W. Sutcliffe, Birmingham. Self-feeding and smoke-consuming fires, &c.

As relates to fireplaces, a hopper is constructed at the back of the grate with a sloping bottom, and divided from the fire by upright bars. It has also a divided sliding top. Slack or fine fuel is placed in this, and the top is closed. When the fire is lighted, it communicates its heat to the slack, the gases of which pass through into the front fire, and are thus consumed. Jan. 20, 1881. Price 8d.

261. W. Jones, West Derby. Chimney-pots and exit ventilators.

An outer shaft is fitted round the chimney shaft above the roof, above which it rises about 2 ft., and a double cone is fixed in the centre of the top of the outer shaft, with one apex placed at the mouth of the inner shaft. (*Pro. Pro.*) Jan. 21, 1881. Price 2d.

270. C. D. Abel, Southampton-buildings. Portable heating apparatus.

This is applicable to heating apparatus of the kind described in the specification of Patent No. 382 of 1880. A water vessel is made of the required shape and size. This has a tube through it, in which the fuel is burnt. This fire-tube may be surrounded by an annular air space if required. (Com. by A. Morel, Epinal, France.) Jan. 21, 1881. Price 6d.

287. J. W. Midgley & B. E. Midgley, Keighley. Stoves, &c.

To economise coal the back of the stove is made adjustable and pivoted at the bottom close to the ribs. It can thus be regulated as desired. (*Pro. Pro.*) Jan 32, 1881. Price 2d.

297. M. Lenzberg & M. M. Lenzberg, Southplace, Finsbury. Stair-rod eyes.

That part of the eye which is fixed to the stair is made of the usual shape, but the eye proper is made separate and screws into a hole in the fixed part so that in can be be adjusted to any thickness of carpet. Jan. 22, 1881. Price 6d.

305. A. C. Henderson, Southampton-buildings. Gas-stoves.

Under the stove is an undulated or smooth cone in form of a parabola, permitting the reflection of the light and heat of the burning gas. (Com. by MM. André & Legrand, Lyon.) Jan. 24, 1881. Price 6d.

307. J. Rule, Dublin. Apparatus for preventing the freezing of water in water-pipes.

An air-valve is fitted above the supply-pipe of the ball-cock, so that when the ball-cock is in action the valve is closed by the pressure of the water. A tap is fitted to the pipe at as low a level as possible below the cistern, and when this is opened, air is admitted through the air-valve, and the pipe is emptied. Jan. 24, 1881. Price 6d.

311. H. E. Newton, Chancery-lane. Ornamenting various surfaces.

To ornament surfaces of plaster, wood, &c., in imitation of marble, the surface is first washed with an adhesive material. A thick paste is then prepared of carbonate of lime and flour, &c., which is placed on the surface to represent the veinings. When this is dry the colour is added. (Com. by E. A. Batonnier, Vitry le François, France.) Jan. 24, 1881. Price 4d.

315. R. C. Robinson, Preston. Manufacture of roofing-tiles.

The head portion of the tile, and the rib, or projection, are formed before the body of the tile in a die, which has opposite its mouth a hollow stop for the rib. The body is then formed in the usual way. (*Pro. Pro.*) Jan. 24, 1881. Price 2d.

2,303. A. M. Clark, Chancery-lane. Fluid meters.

These have a hinged valve on the induction pipe, which throws the fluid on to the blades of an impact wheel. These blades are less in height than the vertical diameter of the pipe, so that the excess liquid can pass over them. The shaft of the impact wheel passes through the top of the meter, and actuates the counting mechanism. (Com. by B. Holly Lockport, U.S.A.) May 25, 1881. Price 6d.

THE LATE MR. CHAS. GRAY, ARCHITECT.

WE have to announce with regret the decease, on the 1st inst., of Mr. Charles Gray, who was best known many years ago as one of the founders, and, if we mistake not, the first honorary secretary, of the Architectural Association of London. The origin of the society is, in fact, to be found in the form of a letter addressed to this journal by Mr. Gray in 1846, advocating the establishment of some better means of education for young architects, and we are always glad to remember that we supported the enterprise so heartily as we did. Since that time the Architectural Association has done a great work, in connexion with which the deceased gentleman well deserves to be remembered with honour. As an architect in practice, Mr. Gray, in early life, attracted some notice by the erection of several buildings divided into suites of residential or business chambers. They were built almost always on corner sites, and commanded attention by their bold and simple style of treatment in brickwork. They are to be seen chiefly in the neighbourhood of Covent-garden and the Strand;* although others of his works, at South Kensington, of more ornate character, Highgate, and elsewhere, do him equal credit. In the competition for the Memorial Church at Constantinople, a design sent in by him was awarded honourable mention, and he took part in other competitions with a due share of praise, if not of profit. Unfortunately, however, he was led into building speculations, and although he did well at the outset, in the end, as he said, "the lawyers had all his money." Mr. Gray's age, at his death, was fifty-three; and we are sorry to hear he has to be numbered amongst those who have left a family unprovided for.

BOROUGH OF PORTSMOUTH SEWAGE DISPOSAL.

THE Corporation of Portsmouth have issued advertisements offering a premium of 500 guineas for the best scheme to dispose of their sewage, and it is one of the most remarkable productions in the shape of an invitation to intended competitors that we have seen. By its terms, and the wording of the memorandum accompanying the plans, we can hardly believe the Corporation to be in earnest. They tell intending competitors that a plan of the borough, showing the sewers and a memorandum thereon, will be forwarded for the sum of two guineas. What this deviation from the custom means we cannot say, but it is as absurdly ludicrous as it would be if the Corporation advertised for a town clerk or for borough surveyor, and asked intended candidates for a fee for the list of duties.

Are we to understand by this that the corporation of Portsmouth are so extremely poor as to be unable to afford giving the plans and instructions gratuitously? If so, how will they possibly be able to pay the premium? If, on the other hand, they have been led into this stupid blunder from a parsimonious economy, it would be well for intending competitors to ask themselves the question if such parsimony will not prevent their parting with the 500 guineas under any circumstances. As to their memorandum, it is conspicuous for its absence of all that information necessary to the engineer to shape a scheme. ENGINEERS.

THE CARRIAGE WORKS AT NEASDEN.

THE raising of the last principal of the roofs of the Metropolitan New Carriage Works, Neasden, was celebrated by a dinner the other day at the White Hart Hotel, Willesden, the chair being taken by Mr. Jackson Gawith, doctor to the works.

These works are on an extensive scale, comprising carriage repairing and painting shop, 194 ft. by 163 ft., and 36 ft. in height up to the gables. The walls are faced with paviors, supplied by Messrs. Nash, of Slough. The floors are of wood blocks on concrete. The buildings are heated with exhaust steam conveyed through the sheds in 5-in. and 7-in. pipes. There are also stores, 208 ft. by 43 ft.; and saw-mill, 136 ft. by 55 ft. Already 50,000 cubic yards of excavation have been removed. It has taken 10,000 yards of concrete, two million of bricks, 350 tons of iron, 400 squares of roofing, 1,400 tons of lime, supplied by Messrs. Greaves, Bull, & Lakin; the ironwork by the Horsley Iron Company, Tipton. The glass was supplied by Messrs. Hawkes, of Birmingham.

The plans were prepared by the Company's engineer, Mr. J. Tomlinson. The contractor for the work is Mr. J. Garlick, Saltley Works, Birmingham. The clerk of works is Mr. John Winstone; the manager of the works, Mr. Henry Charlton, under whose personal supervision the works were carried out. The total cost was about 30,000*l*. Additional buildings are contemplated.

* A view of one of these, Tavistock Chambers, Southampton-street, Strand, will be found in our volume for 1857, p. 375.

STAINES.

A NEW river-wall is being constructed at the back of the new Town-hall, Staines, in order to obtain a regular frontage-line to the river, together with a convenient landing-stage and steps leading to the new roadway at the side of the Town-hall. It is being built partly with bricks and partly with cement concrete rusticated blocks, and will form a retaining-wall to the vacant land at the side of the river. It will be raised, in order to prevent the land from being swamped by the winter floods. The spare land will, in all probability, be sold for building purposes, in plots suitable for a class of house much needed in the town. The whole of the works are being carried out by Mr. Ralph Fitt, C.E., the surveyor to the Staines Local Board.

On Monday morning last Joseph Bowley, a builder, was fined 4*l*., and 15s. costs, for failing to give notice of intention to build, and deposit plans with the surveyor, according to the by-laws.

THE PRESERVATION OF WOOD.

IN order to protect organic substances, for some time at least, against putrefaction, they are, as is well known, impregnated with salt. This process, according to Dr. Krätzer, may also with advantage be applied in the preservation of wood. It has been noticed as a matter of fact that timbering supporting the roofs of salt-mines remains quite unchanged for some considerable time. Cooking salt or common cattle salt recommends itself, therefore, as the cheapest and most practicable means for preserving posts, piles, and, indeed, any woodwork exposed to damp, so as to prevent its rotting in the ground. Cattle salt is solved in warm water to saturation. Into this concentrated solution the wood, which must be well dried, is put, if not of too large dimensions, and left in it for a certain time. Scantlings of large size are coated with the solution until the wood no longer absorbs any more. Posts and piles driven into the ground are best surrounded with a layer of salt, which on its solution soaks into the wood and thus preserves it. Wood thus treated possesses also the advantage of not being attacked by insects or worms.

THE SURVEYORS' INSTITUTION.

WE hear from the Council that the Institution of Surveyors has now been incorporated by Royal Charter, under the above title, by Letters Patent under the Great Seal. Members of the Institution will, in future, be denominated Fellows, with the right to use the designatory letters F.S.I. after their names. The class of Associates is to be subdivided into two classes, Professional Associates and Associates. Present surveyor-Associates are to be placed in the former of these two classes, and are accorded the right to use the distinctive letters P.A.S.I. after their names.

Provision is made for the gradual introduction of the system of examinations for all classes of members which has already been foreshadowed in the education scheme for students, in operation for some time past.

SMOKY CHIMNEYS.

SIR,—I should be much obliged if you could give me any information as to where I could find any particulars about an invention, mentioned in the *Builder*, for curing a smoky chimney, by applying fine wire gauze in front of the fire-place, the atmospheric pressure preventing the smoke from penetrating the gauze. The book in which I saw it mentioned was published ten years ago. J. H. BALL.

*** We are not able to refer, nor does it seem necessary, the suggestion being complete in itself. We print the note, so that any of our readers who may have tried the experiment may tell us the result.

OBITUARY.

The Late Mr. Rendle.—We regret to have to announce the death of Mr. William Edgcumbe Rendle, of Westminster (formerly of Plymouth), who expired on the 3rd instant, at Eastbourne, after a long and severe illness, and who was interred on Thursday last at the Brompton Cemetery. He was born at Compton Giffard, near Plymouth, on February 10th, 1820. He was engaged in several large mercantile pursuits, and was patentee and inventor of what is now known as Rendle's Patent Glazing, which is adopted by H.M. Government and all the leading railways, his latest and largest work being the great Citadel Station at Carlisle. He was also successful in theatrical matters, and was partner with Mr. Augustus Harris, at Drury-lane Theatre, when "The World" was produced. He was also lessee of the Imperial Theatre, Westminster, and proprietor of the Clarendon Hotel, Brighton.

COMPETITIONS.

Darlington Board School. — At a recent meeting of the Darlington School Board, called for the purpose of considering competitive drawings for proposed additions and alterations to the Bank Top Schools, the design of Mr. G. G. Hoskins, F.R.I.B.A., of Darlington, was unanimously selected. The competition was confined to architects resident in Darlington.

Fulham Union Infirmary. — Designs in a limited competition for a new infirmary for the Fulham Union, at Hammersmith, have been sent in. The estimated cost is about 40,000*l.*

BASINGSTOKE BOROUGH SURVEYORSHIP.

SIR,—Being perfectly disinterested in the above appointment, I feel I can say a few words as to the very unfair way in which it has been made, and at the same time show those gentlemen who were applicants how their applications and testimonials were treated. The usual monthly meeting of the Town Council was held on the 1st inst., and after a few preliminary matters had been settled, they proceeded to elect the surveyor. The 129 applications were opened before the meeting, and the name and residence only of each were read. The ex-mayor remarked that he thought they ought to select (say) half a dozen names from those whom they knew, and who lived in the vicinity of the town, and choose from them; but this was not the general opinion of the meeting. However, the present surveyor's foreman was proposed and seconded, and as an amendment another local candidate, in the shape of a gentleman who has a stonemasonry business in the town, was also proposed and seconded, and upon a division the foreman had it by a majority of three, and was declared by the mayor to be duly elected. IMPARTIAL.

*** A more shameful proceeding of the kind never took place. The gentleman elected may, for anything we know to the contrary, be a thoroughly proper man for the post, but the Town Council, having induced a large number of gentlemen to become candidates, ought to have considered themselves bound in honour to examine their testimonials and weigh their merits.

STONE.

SIR,—Referring to your paragraph as to Messrs. W. H. & L. Collingridge having announced the completion of their new building, 148 and 149, Aldersgate-street, I beg to call the attention of your readers to the beautiful façade of the said building, which is of Red Corsehill Stone. SAMUEL TRICKETT.

BATS.

SIR,—Can any of your readers inform me how to expel bats from the inside oak roof of a church?

EDWARD STORY.

New College of Practical Engineering.—A new College of Practical Engineering has been opened at Muswell-hill, near London, under the auspices of a number of practical engineers in the kingdom, among whom we may mention Sir John Anderson, late chief engineer at Woolwich; Sir Henry Bessemer, inventor of the Bessemer process; Sir R. M. Stephenson, founder of railways in the East; and many more. The principal of the college is Mr. John Bourne, C.E., well known by his works on the steam-engine and other kindred subjects. The instruction given will combine theory with practice. One main distinction which its teaching will present is that there will be no cramming, and that everything taught will be permanently and practically useful. Another special feature will be that a number of treatises illustrative of engineering art will be produced at the college, forming together an engineer's library. The hands of the students will be educated as well as their heads.

Books.

The Purchase of Gas and Water Works. By ARTHUR SILVERTHORNE, Consulting Engineer. London: Crosby Lockwood & Co. 1881.

THE Statistics of Gas Undertakings under the Management of Local Authorities, and of London Gas Undertakings under the Management of Local Companies, in the first part of this book; and the Statistics of Water Undertakings under the Management of Local Authorities, and of London Water Undertakings under Local Companies, in the second part, will be found of great use. These have been collected with care, and Mr. Silverthorne, in his preface, acknowledges the assistance he received from the Local Authorities, without whose co-operation much of the information could not possibly have been brought together. These returns afford pregnant texts for disquisitions.

VARIORUM.

ACCORDING to the *Press News*, a very fine work on the City of Paris is now in the press, and is to be published in a thick folio volume as the end of the present year. It is divided into a number of monographs, the compilation of which has been entrusted to some of the most prominent amongst living French authors, together with a list of specialists in Art, Science, and Literature. The various sections are headed "History, Streets and Promenades, Opera, Parisian Fashions, Theatres, Monuments, Life in Paris, High Life, Eating and Drinking, Clubs, the Press, Sport, Political Life and Institutions, Palace of Justice and the Bar, the Water, Prefecture of Police, Artistic Life, Art Collections, Paris from a Balloon," &c. More than 700 illustrations on wood and in zincography and chromo-lithography are to accompany the text.——Cassell's *Popular Educator* gives an explanatory sentence on Engrossing:—"Amongst lawyers the term *engrossing* means the making of a fair copy of any document on a paper or parchment in clear and distinct characters, or, in other words, to transcribe in a legible manner the rough draft of any deed that has been prepared for transcription by a lawyer or barrister. This knowledge will help us to ascertain the meaning of the word *engross*. It is derived, as a little examination is sufficient to show, from the French proposition *en*, in, and the adjective *gros*, large. The expression *to engross*, in its literal acceptation, means to make large, and therefore distinct, as the larger in reason are the characters in which a document is written the more distinct and legible they are. Hence the word *engross*, which, in its primary sense, merely means to make large, has taken a secondary meaning, namely, to copy writing in large or distinct characters: and we can also trace the force of the simple and original meaning in a third signification that has been assigned to the word, when we speak of a person who is occupied in some absorbing pursuit as being wholly engrossed in his occupation—his employment, be it what it may, having taken such a hold on him, and assumed such large proportions in his mind, that he has little or no room there, if we may be permitted to use the expression, for other thoughts."

Miscellanea.

The National Standard Land, Mortgage, and Investment Company, Limited.—The objects of this company, advertised in our present number, include the purchase, sale, and development of large or small estates; the advancing of money on land and buildings, or on debentures and other securities; and the erecting of houses and buildings, and draining or improving the same. The prospectus shows, from an examination of the balance sheets of existing and land investment companies, that considerable profits may be looked for from this class of business if properly conducted. Mr. Edmund Woodthorpe, F.R.I.B.A., is surveyor to the company.

Cardiff.—The new Board of Trade offices have been opened at Cardiff Docks. They were built by Messrs. Kirk & Randall, Woolwich, to designs by Mr. Rivers, surveyor to the Board of Works, and form part of a Government block of offices, including postal and telegraph departments, erected at a cost of 14,000*l.* The site cost about 5,000*l.* in addition.

Sluicing the Pluckington Bank, Liverpool.—The works for carrying out this operation, upon which we commented a short time ago, are now practically complete, and very soon their effectiveness will be put to the test. The *Liverpool Daily Post* thus describes the works which have been executed:—From the George's Dock to the river wall immediately at the back of the George's Stage there is run through the Pierhead an immense pipe or culvert 10 ft. in diameter. This is for the conveyance of water from the dock to the sluicing apparatus, which is constructed at a lower level along by the river wall. There is at the end of this culvert a means of stopping the overflow of water, and this apparatus is worked from the Pierhead. Extending from this monster pipe there is another pipe of almost equal dimensions branching off from it at right angles, which traverses the shore at the back of the George's Stage. From this pipe there are twenty-two subsidiary pipes or outlets running at right angles to it and in the direction of the stage. The diameter of each of these pipes is 4 ft.; the length of each pipe is 45 ft.; and they are laid at a level of 10 ft. below the old dock sill. Each of the sluices is provided with a "clough" or dam, so that the water may, if necessary, be shut off from them. Thus they can be all worked, or only such of them as shall be deemed expedient. Such is the construction of the sluicing apparatus by the aid of which it is hoped that the Pluckington Bank will be washed away. The water available for the sluicing operations is by no means limited to that of the George's Dock. The whole line of the south docks can, if need be, be brought into requisition for the purpose.

Growth of a Co-operative Society.—An interesting account of the progress of the Wholesale Co-operative Society has been published by the *Manchester Guardian*, and some of its particulars are worth reproducing for the lesson they convey. The society was established in 1863, and is a federation of retail co-operative societies carrying on business all over England and Wales. At its start it had a capital of only 999*l.*, and did business in its first year to the extent of but 5,962*l.* Only forty societies were embraced in it, with an aggregate membership of 17,545*l.* According to its balance-sheet, made up at the 25th of June last, 618 different societies have now got shares in it, and 778 purchase their goods through it. Its capital, share, loan, and reserve, is now 563,907*l.*, and the last quarter's sales amounted to 862,000*l.*, those for the whole year being 3,389,000*l.* During the seventeen years of its existence this society has done a business of nearly 28,000,000*l.*, at a cost of only 362,786*l.*, or 1*l.* 8*s.* 1*d.* per cent., its net profits in the same period averaging 1*l.* 4*s.* 2*d.* per cent., which was enough to pay the 5 per cent. fixed interest on the capital, and an average dividend of 8¼ per cent. in addition. The society has buyers in Ireland, Rouen, and New York, and latterly in Copenhagen; and it possesses two manufactories of boots and shoes, one in Leicester and one in Heckmondwike, but these have caused some dispute as to the allocation of profits, the workmen declaring that the profits of labour ought not to be divided on the same basis as the profits of the distributing trade.

Wesleyan Orphanage.—An addition to the benevolent institutions of the Midland district is about to be made by the erection of a Wesleyan orphanage near Erdington, Birmingham. Some time ago Mr. S. Jevons, a former resident in Birmingham, and one of the trustees of Sir Josiah Mason's Orphanage, offered to subscribe 10,000*l.*, if the Wesleyan Conference would vote a similar sum from the Thanksgiving Fund for the purpose of erecting an orphanage for the children of Christian parents. The offer was accepted, and 18 acres of land have now been purchased at a cost of 2,700*l.* in the neighbourhood of Oscott College. It is intended to begin building operations within a short period, and it has been decided that the institution shall consist chiefly of small detached homes, similar to others under the superintendence of the Rev. T. B. Stephenson, in Bonner-road, Victoria Park, London.

Safety Tap.—Messrs. John Warner & Sons, of Crescent Foundry, Cripplegate, tell us that their Mr. Goslin has just invented a safety tap for close boilers, kitchen ranges, and hot water heating apparatus, which, amongst its advantages, can be regulated to suit any and every pressure.

The Metropolitan Gas Companies.—A Parliamentary paper has been issued giving the results of the working of the metropolitan gas companies for 1880. It appears that the total capital and borrowed money of all the companies is 13,025,955*l.*, the Gaslight and Coke (the largest gas company in the world) standing for 9,469,943*l.*, the Commercial for 745,815*l.*, the London for 858,675*l.*, and the South Metropolitan for 1,951,490*l.* The total income from all sources was in the case of the Gaslight and Coke Company, 2,615,979*l.*; Commercial, 316,440*l.*; London, 315,036*l.*; and South Metropolitan, 745,842*l.*, or a total of 3,993,298*l.* The gross profit of the Gaslight and Coke Company was 899,909*l.*; of the Commercial, 102,224*l.*; of the London, 69,615*l.*; and of the South Metropolitan, 221,935*l.*; together, 1,293,684*l.* On capital and borrowed money this profit was equal to 9*l.* 10*s.* per cent. in the case of the Gaslight and Coke Company, 13*l.* 4*s.* 2*d.* per cent. in that of the Commercial, 8*l.* 2*s.* 2*d.* in that of the London, and 11*l.* 7*s.* 6*d.* in the case of the South Metropolitan,—the average of the whole being 9*l.* 18*s.* 8*d.* per cent.; while on the gas rental the profit per cent. was 45*l.* 7*s.* 2*d.*, 43*l.* 4*s.* 11*d.*, 29*l.* 4*s.* 1*d.*, and 40*l.* 4*s.* in the case of the four companies respectively.

Condition of Athens.—An alarming outbreak of typhoidal fever in Athens is reported, without much surprise to those who know the disregard of sanitary precautions practised there. The *Times* correspondent says:—"The mayor, who has certain duties still permitted him, in his anxiety to keep up the water supply through this exceptionally hot summer had turned into the main reservoir a stream in which the washerwomen of Cephissia have had from time immemorial their washing pools, and where is washed the linen of Athens, with its hospitals, civil and military; and the streets of the city, the windiest and dustiest in Europe, have been sprinkled with its waste waters, so that the dust, even, is charged with the desiccated matters contained in this waste water. If nature had not provided Athens with the purest air and the most salubrious position possible, the plague would have made its breeding-place here long ago." The authorities are moving in such directions as they may; but until the hot season is over, and the rains return in the latter part of September, or possibly not before the middle of October, nothing, it is thought, can be done effectually.

Statue of Marco Polo in Venice.—A statue of Marco Polo, discovered in Canton, has been received at his native city, Venice. It is life-size, made of wood, and gilt. According to a foreign contemporary, the famous Venetian traveller is represented seated, wearing the Chinese attire, although the cloak and hat are after the European fashion. His moustache and beard, which surround his face, are tinged dark blue, and while the Chinese artist has given him a peculiar form, the features in no way resemble those of a Mongolian type. Opposite the large red easy arm-chair, upon which Marco Polo is seated, is placed a porcelain bowl, intended to receive perfumes with which he was honoured in the same manner as is the protecting genius of China in the temple of Canton. The statue has at the foot an inscription in Chinese characters.

Window, Mansfield.—Messrs. Pitman & Son, 30, Newgate-street, have executed a stained-glass window for the west end of St. Chad's Church, Stuffynwood, Mansfield, Notts. It is a three-light window with lancet heads and tracery. The centre compartment contains a figure of St. Chad, robed in episcopal vestments, holding in one hand a pastoral staff, and in the other the model of a church. He was Bishop of Lichfield (on the borders of which diocese this church stands), and according to the calendar of the English Church, March 2nd is St. Chad's day. The side windows are filled with geometrical designs in leaded glass.

Dover Priory Gateway.—We have received a somewhat intemperate letter from an "Inhabitant of Dover" complaining of the substitution of an eminent London architect in the restoration of the Priory Gateway (for the purposes of the Dover College), for the local architect who has always acted for the college. Doubtless there were sufficient reasons. Anyhow we decline to print the letter.

Royal Manchester Institution.—The annual exhibition of modern works of art here, the sixty-first, was opened to the public on the 7th inst.

New Wesleyan Chapel, Walton-le-Dale. The corner-stone and memorial-stones of this chapel have been laid. The site contains 519 super. square yards. The style is Gothic. The building is to be of brick, with stone dressings, having ornamental brick panels in the gable and in other parts of the structure. The internal woodwork will be of pitch pine, stained and varnished. The roof will be open timbered, having carved and moulded principals. The dimensions of the chapel will be 52 ft. 3 in. by 29 ft. There will be a transept on the east side, a chancel measuring 19 ft. by 9 ft., and a vestry in the rear. The whole contract, including the pulpit, heating apparatus, gas-fittings, railings, gates, &c., has been let to Mr. H. Ward, of Preston, for 1,277*l.* 19*s.* 4*d.* The architects are Messrs. Myres, Veevers, & Myres.

Singular Cause of a Fire.—Some time ago the suspension-bridge of Mr. Roebling, crossing the Alleghany, near Pittsburgh, U.S., was almost destroyed by fire. At first it was found impossible to discover how the bridge could have caught fire. Further investigation has led to the conclusion that it arose from the fact that thousands of sparrows had been in the habit of building their nests of hay and straw in the interstices of the woodwork of the under portion of the structure. The conflagration was caused by sparks from the chimneys of the steamers plying upon the river beneath lodging in and kindling some of these nests.

The Parkes Museum.—This museum is closed till October, when it will again be opened free to the public on Tuesdays, Thursdays, and Saturdays; and during the winter, lectures on sanitary science will be given in the museum, illustrated with the appliances deposited in the museum, and many contributions sent from the recent exhibition at South Kensington. We believe it is intended to distribute the awards to the exhibitors at the public annual meeting of the subscribers to the museum in October or November.

New Sunday Schools at Kidderminster are about to be erected by the Baptist denomination, from plans prepared by Messrs. Ingall & Hughes, architects, Birmingham. They provide a spacious central room for massing the children at the opening and close of the schools; also twenty class-rooms,—ten downstairs and ten upstairs,—opening into a gallery round three sides of the room. The builder is Mr. R. Thompson, of Kidderminster, the amount of whose contract is 1,989*l.* 10*s.*

Liverpool and Southport.—Of the new North Docks (opened by H.R.H. the Prince of Wales on Thursday last), of the Royal Court Theatre (to be opened this Saturday, the 10th), and of other new works in Liverpool, as well as of the new market at Southport opened on Wednesday last, we are compelled by exigencies of space to postpone particulars to next week.

Surveyors' Salaries, Eastbourne.—The salary of the town surveyor of Eastbourne (Mr. Charles Tomes) has been raised by 100*l.*,—from 275*l.* to 375*l.* The salary of the building surveyor (Mr. E. W. C. F. Schmidt) has been increased by 35*l.*

Art Director.—We are informed that Mr. Thomas Armstrong will succeed Mr. Poynter, R.A., as Art Director at South Kensington, and Mr. Sparkes (now head-master) as Principal of the National Art Training School.

Fine Art Exhibition at Bolton.—A fine-art exhibition, in aid of the Bolton Infirmary, was opened in the new buildings of that institution on the 5th inst.

The New Townhall at Hastings was opened on Wednesday, the 7th inst. In our last volume (pp. 570, 572) we published a view, plan, and description of the building.

TENDERS

For the erection of a school residence for young ladies, at Goudhurst, Kent, for the Rev. J. J. Kendon. Mr. Wm. Theobalds, architect. No quantities:—

Fowler	£1,067 0 0
Warrington	1,000 12 8
Marshall Bros.	1,000 0 0
Bingham	997 0 0
Martin	980 0 0
Morris	950 0 0
Tulley	947 0 0
Player	915 0 0

For alterations at 22, 23, and 24, Argyll-street, and 253, and 254, Regent-street:—

	10 weeks.	Complete in 13 weeks.	16 weeks.
Hall, Bedall, & Co. ...	—	... £3,970	... £3,970
Macey & Sons	3,900	... 3,620	... 3,490
Bywaters	3,894	... 3,494	... 3,254
Clemence	3,500	... 3,341	... 3,181

For works of town drainage and sewage disposal for the Chard Urban and Rural Sanitary Authorities. Mr. Charles W. Whitaker, engineer:—

Hunter	£6,181 0 0
Trimm	5,270 0 0
Hawkins	5,100 0 0
Botterill	5,021 0 0
Rendle	4,950 0 0
Coldridge	4,850 0 0
Brown	4,719 0 0
Bottoms	4,610 0 0
Frayne & Co.	4,507 0 0
Krauss	4,499 0 0
Crocham	4 456 0 0
Langdon & Poole	4,400 0 0
Hayward (accepted)	4,277 0 0

For the erection of three shops and premises in Market-street, Coventry, for Messrs. R. B. & T. Burbidge. Herbert W. Chattaway, architect:—

J. Marriott, Coventry	£900 0 0
H. Price, Coventry	810 10 0
G. Frith, Coventry	802 0 0
E. Smith & Son, Kenilworth	799 0 0
Hallam & Co., Coventry	795 0 0
J. Woof, Coventry	780 0 0
J. Worwood, Coventry	773 0 0
G. Storer, Coventry	750 0 0
C. Haywood, jun., Coventry	710 0 0
Thos. Mayo, Coventry (accepted)	667 0 0

For taking down and rebuilding Cock Roads Farmhouse, Hill, Southampton, for Colonel Atterley. Mr. R. Critchow, architect. Quantities by Mr. E. T. Howell, surveyor:—

Chapman, Itchen	£513 0 0
Brinton & Bone, Southampton	465 0 0
Bostock, Southampton	431 7 4
Dyer, Portswood (accepted)	426 0 0

For taking down and rebuilding Wellington Foundry Charles-street, City-road, for Mr. B. Slater. Mr. Thomas Milbourn, architect:—

Sabey & Son	£1,265 0 0
R. Marr	1,264 0 0
Staines & Son	1,186 0 0
Langmead & Way	1,144 0 0
J. H. Fernley	1,085 0 0
Palmer & Sons	1,068 0 0
W. Royal	1,066 0 0
J. Anley	1,045 0 0
Snow & Co.	1,033 0 0
R. Conder	1,029 0 0
G. Crabb	998 0 0
W. & H. Salmon	924 19 9

Accepted for the erection of three villa residences at Arnside, near Grange, Westmoreland, for Mr. William Mitchell. Mr. William J. Newton, architect:—

W. & B. Hinchcliffe,* (Masons, &c.†)	£800 0 0
J. G. Parker, Windhill (Joiner)	398 0 0
M. Bland (Plasterer)	150 0 0
A. Hill (Slater)	102 0 0
S. Ullathorne (Plumber)	100 0 0
G. E. Atkin (Painter)	65 0 0

* All the contractors, except for joinery, are of Bradford
† Wall stones found.

For the erection of residence at Willow Grove, Chiselhurst, for Mr. H. E. Tindall. Mr. A. R. Stenning, architect. No quantities supplied:—
T. Crossley, Bromley (accepted).

For the erection of a warehouse at Willow Brook Grove, Trafalgar-road, Old Kent-road, for Mr. Richard Nugent:—
George Brown, Peckham (accepted).

For the erection of a house and laundry in Park-road, North Acton, for Mr. J. Howell, jun. Mr. N. Kempthorne, architect:—
Huntley & Rooney, Acton (accepted) £545 10 0

Accepted for granite, ballast, and hoggin, per cubic yard, for the Local Board, Wanstead:—

	Leicester.	Guernsey.
Granite, delivered at Station.	s. d.	s. d.
John Mowlem & Co., Grosvenor Wharf	11 3	... 12 3
Ballast, delivered on the Roads.		
Frederick Stock, New Wanstead	6 6	
John Richards, Woodbine-place	6 6	
Thomas Skennerton, jun., Woodbine-place	6 0	
Hoggin, delivered on the Roads.		
Thomas Skennerton, jun.	5 9	

Accepted for additions and alterations to parsonage house, for Mr. W. Dowe, Wyld Court. Brick, tiles, sand and lime provided. Mr. J. S. Dodd, architect:—

Morton (Bricklayer)	£165 0 0
Fulker (Carpenter)	175 0 0
Jackson (Plumber and Ironwork)	81 7 0
Phillips (Glazier)	28 0 0

For additions to Elm Cottage, South Stoke, for Mr. J. King. Bricks, &c., provided. Mr. J. S. Dodd, architect:—

Brasher, Wallingford	£516 0 0
Dodd, Caversham	515 0 0
Heilly & Butler, Nettlebed	500 0 0
Smallbone, Streatley (accepted)	479 0 0

For additions to gardener's cottage, Wallingford, for Mr. J. K. Hedges. Mr. J. S. Dodd, architect:—

Holly & Butler, Nettlebed	£258 0 0
Weller, Wallingford	240 0 0
Brasher, Wallingford (accepted)	222 15 0

For painter's work and general repairs to the Cottage Sonning, for Mr. J. Hunt. Mr. J. S. Dodd, architect:—

Harris, Reading	£182 10 8
Sissley & Goddall, Reading	179 16 0
Brown, Sonning (accepted)	175 10 0

For residence at Holly Park, Crouch-hill, Hornsey. Mr. F. Chambers, architect:—

Smith & Sons	£2,139	0	0
Pocock	1,965	0	0
Castle	1,880	0	0
Gould & Brand	1,839	0	0
J. Grover	1,822	0	0
Haisman	1,799	0	0
Shurmur	1,683	0	0

For proposed new children's ward, West Kent General Hospital, Maidstone. Mr. E. W. Stephens, architect:—

Higgs, London	£1,949	0	0
Calland, Rochester	1,920	0	0
Paramore, Margate	1,900	0	0
Simmonds, Maidstone	1,894	0	0
Naylor, Rochester	1,879	0	0
Hammond, Aylesford	1,852	16	10
Warr, Croydon	1,841	9	0
Wallis & Clements, Maidstone	1,798	0	0
Cox Brothers, Maidstone	1,775	0	0
E. Vaughan, Maidstone	1,750	0	0
Avard, Maidstone	1,729	0	0

For a pair of cottages at Rokeby-road, New Cross, for Mr. John Ley. Mr. W. T. Hunt, jun., architect:—

Boorer	£690	0	0
Holloway	669	0	0
Rodwell	643	0	0
A. & F. Smith	605	0	0
Hubble & Trott	595	0	0
Jerrard	592	0	0
Redman (accepted)	575	0	0

For Maidstone Cattle Market. Mr. E. W. Stephens, architect:—

Builder's Work.

Wallis & Clements, Maidstone	£187	0	0
E. Vaughan, Maidstone	184	0	0
Cox Bros., Maidstone	180	0	0
Gray, Maidstone	179	0	0
Avard, Maidstone	174	0	0
Elmore, Maidstone	167	0	0
Simmonds, Maidstone	162	0	0

Ironfounder's Work.

W. Rammage, Stratford	£902	16	5
Jukes, Coulson, Stokes, & Co., London	721	0	0
W. Weeks & Son, Maidstone	660	0	0
Goddard & Massey, Nottingham	585	10	0
Joseph Stone, Southwark	548	17	4
Bayliss, Jones, & Bayliss, Wolverhampton	518	1	0
Messrs. Brettell, Worcester	501	5	8
Balls, Garrett, & Co., Maidstone	498	0	0

For new roof over Elementary Room, for the Nottingham School of Art. Messrs. S. Dutton Walker & Howitt, architects:—

Scott	£850	0	0
Vickers	830	0	0
Lynam	799	0	0
Bell & Son	798	0	0
Clarke	768	0	0
Fish & Son	705	0	0
Jelley, Nottingham (accepted)	668	15	0

For new "Plant Form" studio for the Nottingham School of Art:—

Messenger, Loughborough (accepted)	£902	10	0

For new schools in connexion with St. Andrew's Church, Thornhill-square. Mr. William Smith, architect:—

Larke	£1,870	0	0
Dunford & Langham	1,689	0	0
Mattock	1,671	0	0
Harper	1,632	0	0
Shurmur	1,583	0	0
Cole & Chant	1,555	0	0
Stevens	1,548	0	0

For warehouse, Hoxton-square, for Messrs. M. A. Harper & Co. Mr. William Smith, architect:—

Shurmur	£1,090	0	0
Harper	1,075	0	0
Dunford	1,059	0	0
Mattock	933	0	0
Wilkinson	917	0	0
Larke	890	0	0
Stevens	887	0	0
Steele Bros.	875	0	0

For paving, channelling, and making up Croydon-street, for St. George's Sanitary Authority. Mr. Wm. Dawson, C.E., surveyor to the Board:—

Kirby & Hickory	£338	8	4
Adams	295	2	8
Parke	295	2	6
Caise & Day	289	15	4
Derrick	285	6	6
Lovell	280	10	10
Osborne	272	14	8
Martin & Moodey	265	13	9
Brittan & Froude	256	13	4

For sundry alterations, additions, and decorations to Thames Ditton House, Thames Ditton, Surrey, for Mr. W. W. Fitzwilliam Dick:—

J. Vears & Co. (accepted)	£1,596	0	0

For converting two private houses into shops, Stroud Green-road. Mr. William Smith, architect:—

Harper	£725	0	0
Dunford & Langham	646	0	0
Mattock Bros.	593	0	0
Larke	584	0	0
Wilkinson	473	0	0

For pulling down and rebuilding the Royal Paper Mills, Wallington Bridge, Surrey. For Mr. A. Smee. Mr. Richard Creed, architect:—

Cuthbert	£894	10	0
Colls & Son	839	0	0
Smith & Sons	807	0	0
Stewart	778	0	0
Keal	750	0	0
R. & E. Smith	735	0	0
Humphries	705	0	0

For sundry alterations and repairs to Nos. 354, 356, and 358, Mile End-road. Mr. C. A. Legg, architect. Quantities by Mr. Wm. Hawker:—

Stokes	£897	0	0!
Judd	599	8	0
Calnan	524	0	0
Vear	515	0	0
Lusk	478	0	0
Parish	420	0	0!

TO CORRESPONDENTS.

Vergers of York Minster.—We have received some letters on this subject, *pro* and *con*., too late for consideration this week.—W. J. L.—L. L.—B. van der B.—M. H. J.—T. L.—O. F. H.—H. R. B.—J. F. D.—R. W. & Son.—W. F. G.—I. S.—D. & Son.—D. W.—J. C. R.—A. S. J.—J. V. & Co.—W. D.—C. F. H.—T. F. A. A.—W. S.—W. N.—E. W. S.—S. S.—E. C. R.—C. T.—W. S.—C. W. W.—Dr. P.—T. C. M.—O. S.—C.—H. T. T.—Miss B.—"South Aspect."—J. N.—N. K.—J. B.—P. Bros.—H. W. C.—S. T.—J. & W.—C. F. K.—T. M.—G. B.—T. R. S.—J. N. C.—H. G.—C. S.—C. E. B.—R. & R. S.—W. T.—C. & Co.—R. F.—R. P.—J. B. L.—T. C. S.—W. G. T. (illegible).—R. K. (thanks)—"Seaside" (next week).

All statements of facts, lists of tenders, &c. must be accompanied by the name and address of the sender, not necessarily for publication.

We are compelled to decline pointing out books and giving addresses.

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

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